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GRINDING and FINISHING

FEBRUARY · 1960

IN THIS ISSUE:

U.S. Steel Doubles Snagging Rate

Standard Time Data for Cylindrical Grinding

How's Your Buffing Average?

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TECHNOLOGY DEPARTMENT

WHY HONING?

—page 28

MACKLIN
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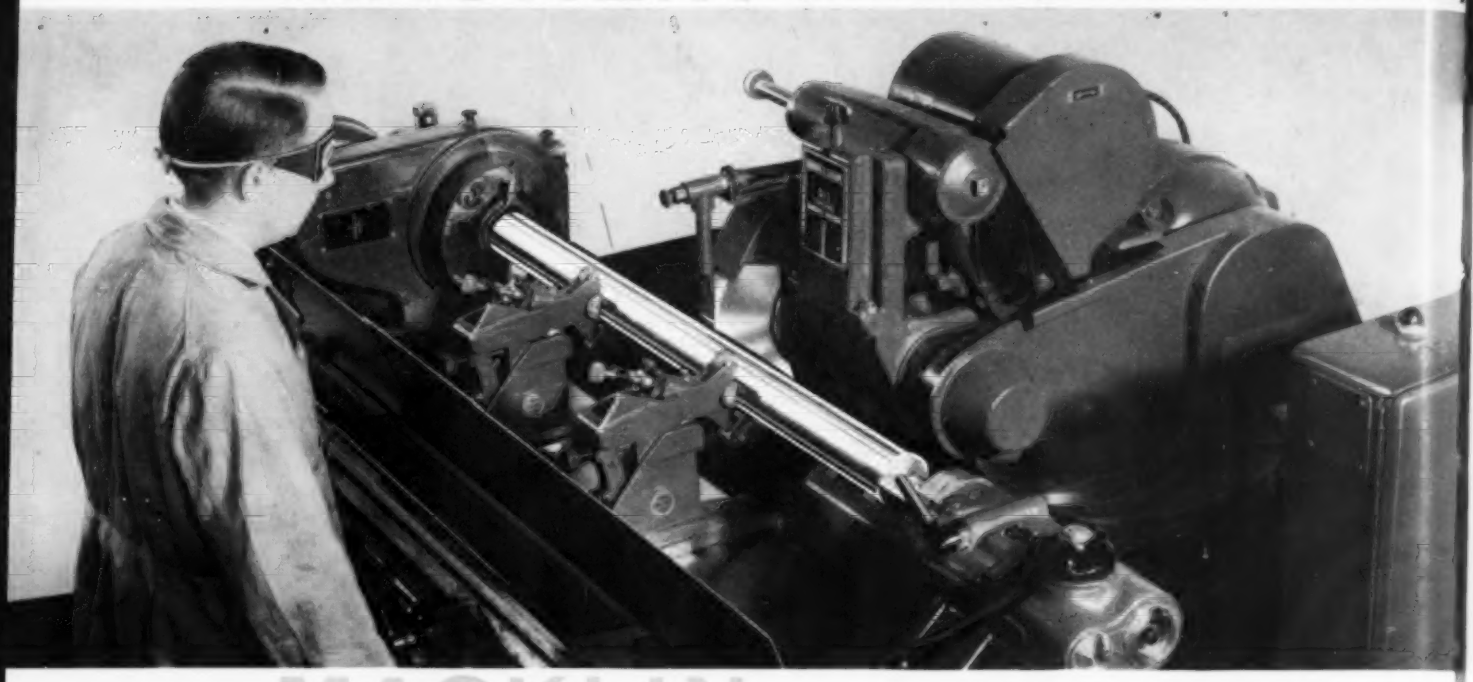
In cylindrical grinding, too, for production, precision, and economy



YOU CAN DEPEND ON MACKLIN "Wheels of Profit"

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For complete information, send for Bulletin CLY.

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WHEREVER ABRASIVE OPERATIONS ARE PERFORMED

GRINDING and FINISHING

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FEBRUARY COVER: An artist's conception of the path of a couple of abrasive grains on the surface of honing stones working around the inside of a cylinder dominates the cover. A typical honing tool and, above, some commonly-honed parts complete the picture.

Subscription rates: $6.00 per year in U.S.A. $7.50 per year elsewhere.
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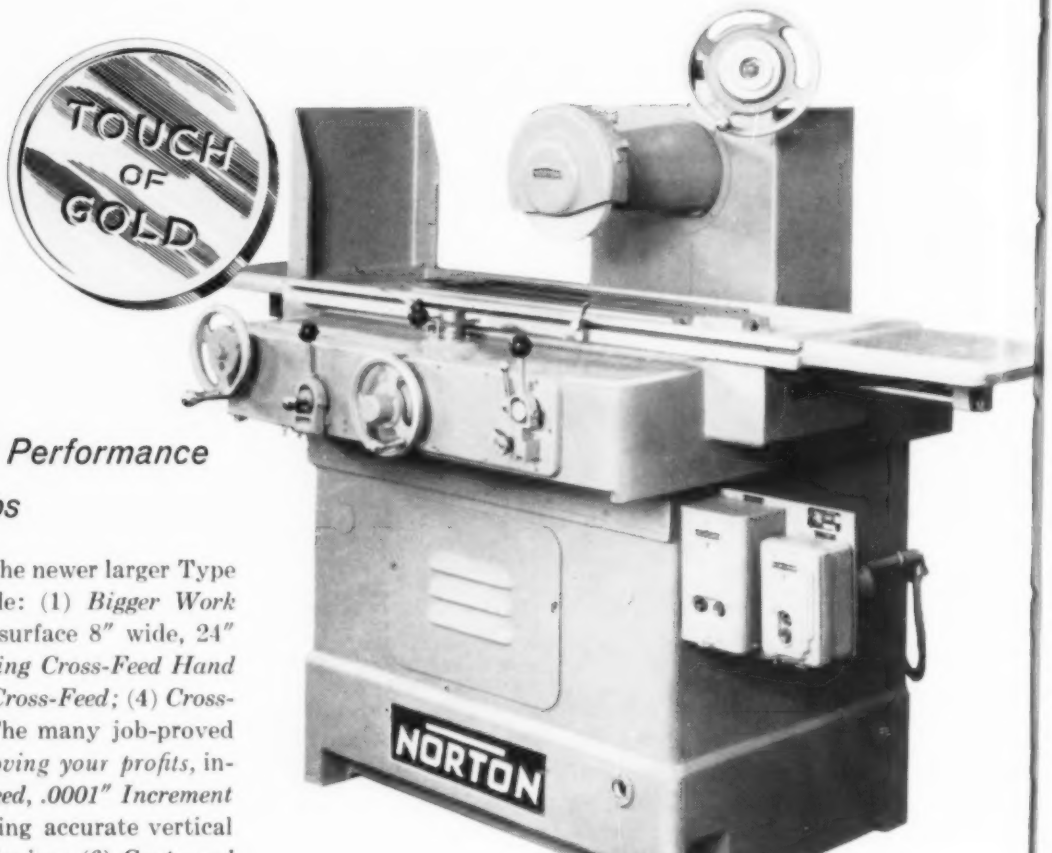
A big success...so...



Bringing Top Performance to Larger Jobs

New additions to the newer larger Type S-3 grinder include: (1) *Bigger Work Table*, with work surface 8" wide, 24" long; (2) *Interlocking Cross-Feed Hand Wheel;* (3) *Power Cross-Feed;* (4) *Cross-Feed Stop Dogs.* The many job-proved features, *for improving your profits*, include: (5) *Two-Speed, .0001" Increment Hand Wheel* assuring accurate vertical feed and fast positioning; (6) *Contoured Splash Guards* providing better sighting and loading.

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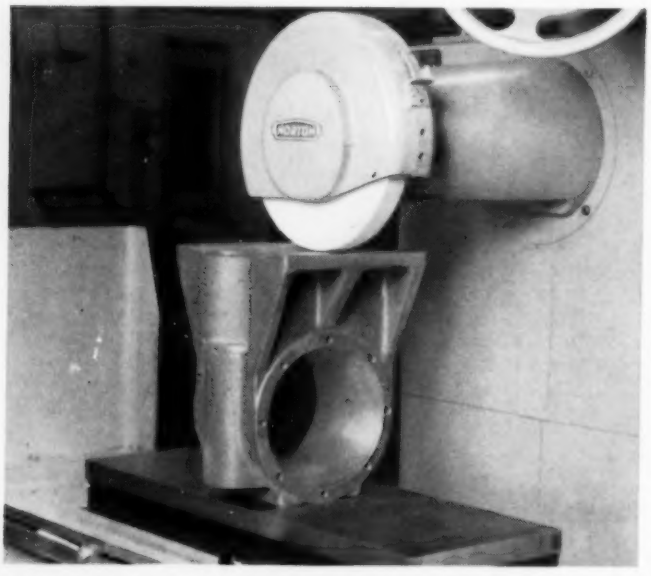
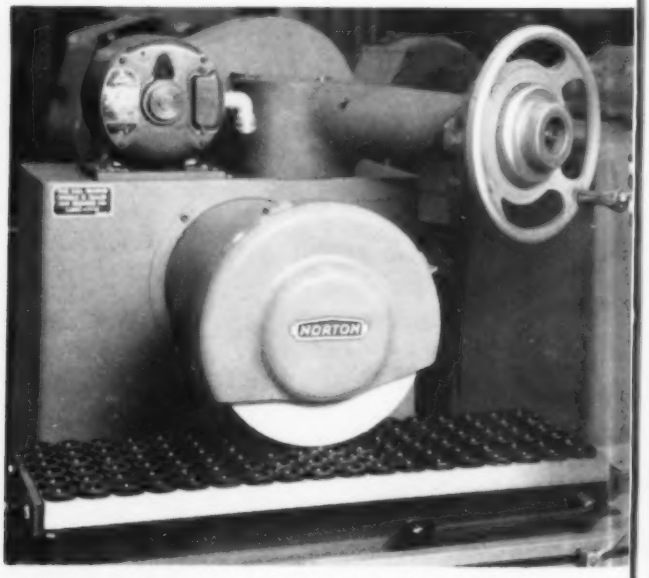


High-Grind Wheel Head Construction, provides 13¾" vertical capacity from table top to bottom of standard 10" diameter grinding wheel, for handling tall workpieces.



125 Feet Per Minute is the Type S-3's high table speed that enables you to produce smoother plane surfaces, cut grinding time and increase production rate.

we're building it bigger!

Norton Type S-3 surface grinder... with proved ability to finish flat faster... Now available in 8" x 24" size

Performance of the new Norton 6" x 18" Type S-3 surface grinder for customers like these . . . Addressograph-Multigraph Corporation, Clevite Corporation, Cleveland Graphite Bronze Division, National Cash Register Company, The Timken Roller Bearing Company, Warner & Swasey Company . . . has made this larger size a necessity.

Besides a longer and wider work table, other design advancements enable this top-ranking surface grinder to finish bigger workpieces smoother, faster, at lower cost. Get the whole story from your Norton Sales Engineer, a trained specialist who can help you get better grinds for less money, or ask for our catalog 1982. NORTON COMPANY, Machine Tool Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

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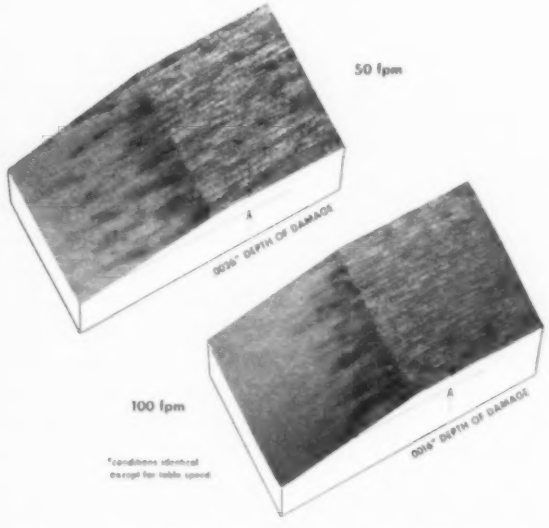
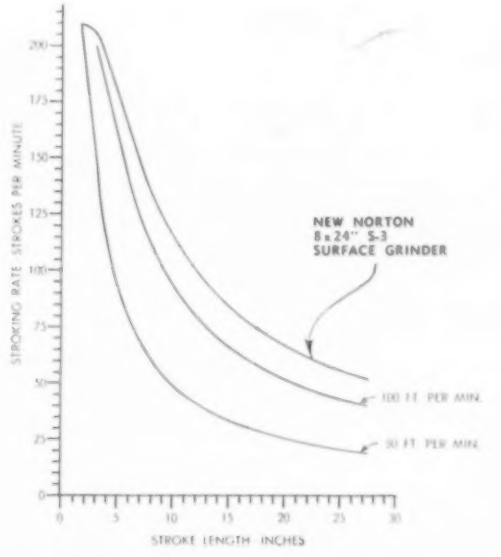


Better Quality Work due to less heat damage with faster table speeds . . . at the same time greatly increasing the rate of stock removal.



Calculate Your Savings from this Production Rate Chart. Grinding time is reduced in proportion to the increase in stroking rate.

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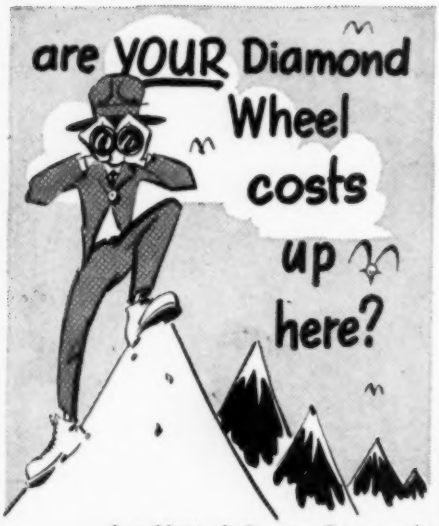

. . . let United States Diamond Wheel Co.'s on-the-job "PROGRESSIVE SPECIFICATION" show you how to get "down-to-earth" carbide grinding costs. This scientific system has proved profitable on every application and it is warranteed to do the same for you!

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PRESSURELOK (the Performance bond) makes the best of Diamond wheels because it scientifically combines warranteed amounts of graded Diamonds distributed in constant density throughout a perfect bond which wears uniformly at the ideal rate of Diamond usage.

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Editor's Mail

December Cover, Editorial

I would like to compliment you on the December cover of GRINDING and FINISHING and on the very fine Christmas editorial, because this type of thing is seldom found in industrial literature. I think it is very heartening.

I gave the cover and your editorial to our youth minister. He is planning to use it in one of his sermons to the young people. This type of thing helps to increase our faith in our fellow man.

Recto Molded Products, Inc.
R. N. Backscheider
Cincinnati, Ohio

In this era with its accent on scientific achievement and material things, it is indeed refreshing to see the cover on the December issue of GRINDING and FINISHING, and to read your editorial. Congratulations to you and to your artist.

Claude B. Schneible Co.
A. S. Lundy
Chief Engineer
Detroit, Michigan

I do not often have occasion to see copies of GRINDING and FINISHING, since most of the articles do not concern me. However, I was pleasantly surprised to see the attractive and appropriate cover of the December issue.

I also enjoyed the editorial, unusual as it is to find that sort of thing in an industrial publication.

Fisher Governor Company
John Harder
Chief Industrial Engineer
Marshalltown, Iowa

Requests to Reprint

Your editorial, "Control Non-Productive Costs," in the August '59 issue of GRINDING and FINISHING has taken the eye of our works manager. With your permission, we should like to reprint it for distribution to some of our management personnel. We will, of course, give credit to the source.

May we have your permission. I'll send you a few copies as reproduced.

Greenlee Bros. & Co.
L. J. Schmidt
Director of Industrial Relations
Rockford, Illinois

In the October, 1959, issue of GRINDING and FINISHING you printed our article, "Home-Made Rig Automates Sanding."

We would like to reprint this piece for distribution to our customers. We will, of course, credit it as being a reprint from GRINDING and FINISHING.

May we have your permission to have reprints made.

Taylor Fibre Co.
Joseph J. McLoughlin
Manager Sales Promotion
Norristown, Pennsylvania

Permission, of course granted. It is a pleasure to comply with requests such as these.

Trip to Russia?

As you probably know, a number of groups representing various industries or trade and manufacturing associations have been going to Russia of recent days to look, see and report back.

We would be interested in joining a grinding industry group and are wondering whether you know of one being organized, or of someone who intends to organize such a group.

Possibly you could be of assistance to us in advising how we might proceed or whom to contact. . . .

MBP, New York

Several possibilities were suggested in response to this inquiry, none of which was definite. However, if any other readers are interested, or know of such a project, we'll be glad to serve as a clearing house for the exchange of information. Write to:

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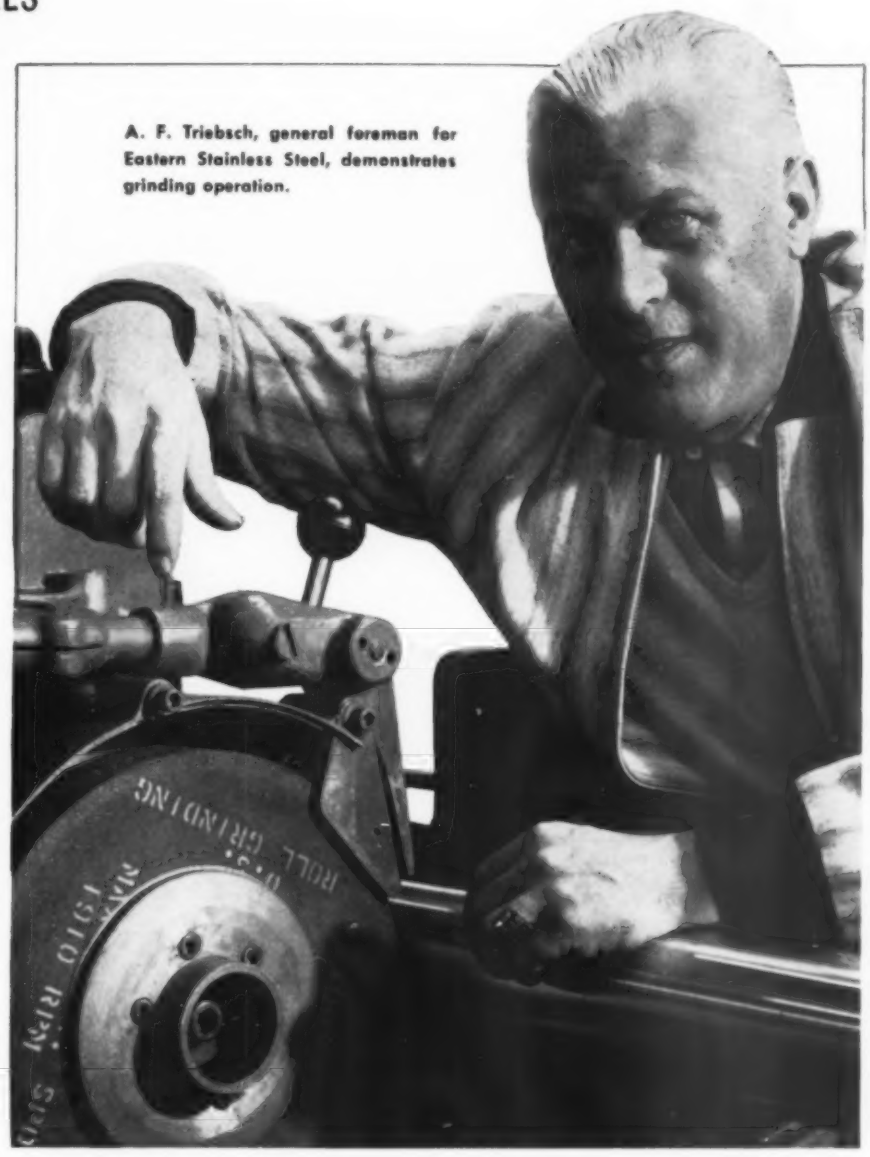

A. F. Triebsch, general foreman for Eastern Stainless Steel, demonstrates grinding operation.

"U.S." Grinding Wheels help EASTERN STAINLESS STEEL achieve tolerances of 2/10 of .001" in precision work

In producing stainless steel of great precision, the steel passes through a succession of work rolls under a combined force of 59,000 pounds per square inch. All the rolls must be perfectly round and the tiniest defect must be eliminated. To produce a perfectly flat mirror finish, the rolls have to be 2/10ths of .001" perfect!

This is the kind of work Eastern Stainless Steel Corporation turns out every day. To keep their rolls in perfect balance and symmetry they use "U. S." Grinding Wheels. These amazing wheels allow for no "chatter" or vibration, consequently they never groove the roll. Prior to the use of "U. S." Grinding Wheels, at least an hour a day was lost when the operator had to readjust the machine.

Using "U. S." Wheels, Eastern Stainless Steel found many collateral advantages. Maintenance was reduced by more than 20%. "U. S." Grinding Wheels outlast conventional wheels at a ratio of 4 to 1, an obvious saving of 400%.

You, too, can effect important economies and achieve greater precision by turning your grinding wheel problems over to U. S. Rubber.

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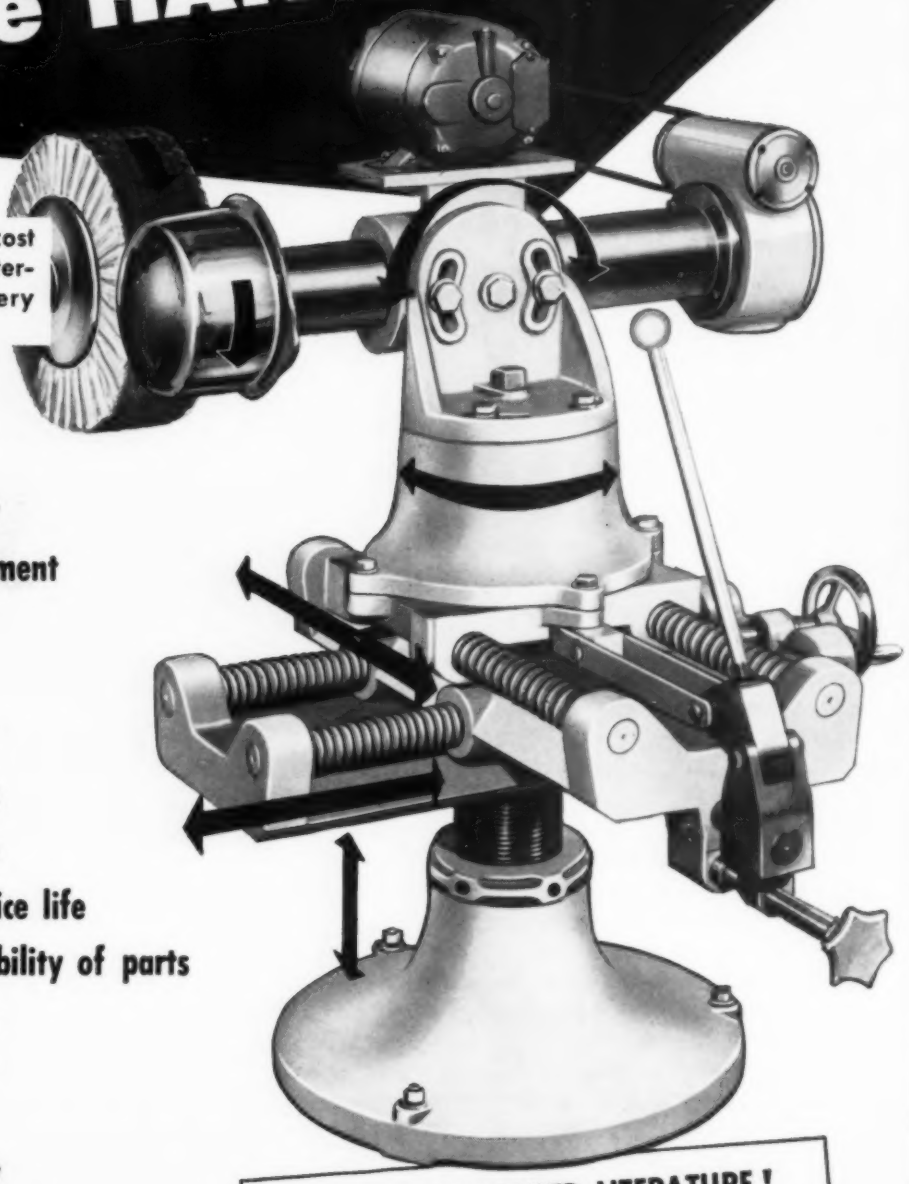

A Murray-Way engineered, low cost basic machine with standard, interchangeable components for every work shape and size.

HAN-D-MATIC gives you —

- Top quality equipment
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- Increased output
- Lower production cost
- Uniformly better work
- Minimum maintenance
- Long, dependable service life
- Complete interchangeability of parts
- Reduced work hazards
- Less operator fatigue

MURRAY WAY

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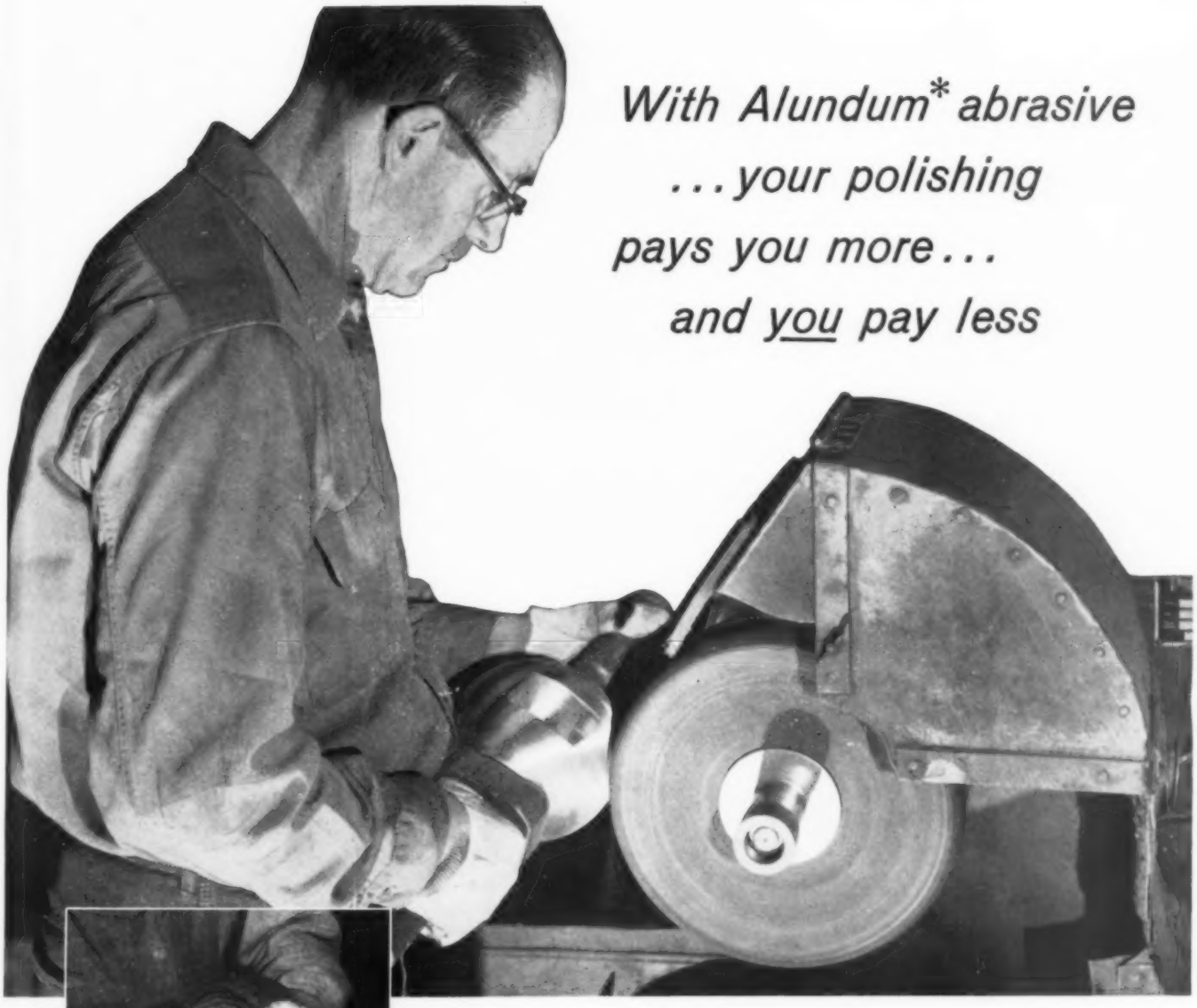
With Alundum* abrasive ...your polishing pays you more... and you pay less



A stainless steel floating ball, chief feature of a leading valve manufacturer's product, requires a high polish for its high efficiency. ALUNDUM abrasive is the leading manufacturer's selection for this important polishing job.

Setting up your polishing wheels with ALUNDUM abrasive is easy and profitable. This grain's high capillarity speeds and strengthens the wetting process with glue or cement — making your wheels last longer and polish better.

Where finish is essential to product appeal or product efficiency, Norton ALUNDUM abrasives are the first choice in many plants. For extra long service life the blocky-shaped E_1 ALUNDUM B abrasive in grit sizes 14 to 240 is widely popular. For faster cutting action E_{33} ALUNDUM S abrasive (grit sizes 14 to 90) or E_{38} ALUNDUM R (grit sizes 100 to 240) are preferred.

Uniform grain shapes and sizings of these popular Norton abrasives assure fast cutting action, with no oversize grains to mar the finish, no undersize grains to lag on the job. And their high capillarity provides the easy absorption of glue or cement that means longer lasting, better performing set-up wheels.

The booklet *"Setting Up Metal Polishing Wheels and Belts"* tells you about the various types of ALUNDUM abrasives . . . or their uses when applied to canvas, leather or wooden wheels . . . and the best means of preparing wheels. Ask your Norton Distributor for it. Or write to NORTON COMPANY, General Offices, Worcester 6, Massachusetts. Plants and Distributors around the world.

*Trade-Mark Reg. U. S. Pat. Off. and foreign countries

NORTON ABRASIVES

G-383

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HOW POSITIVE DUPLICATION IS ACHIEVED

The predictable performance of these wheels is the positive result of Cincinnati's unique (PD) manufacturing process. It involves 36 separate quality controls which produce grinding wheels of unsurpassed uniformity. For example, sensitive print-weigh scales put an unmistakable record on each mix card of the exact amounts of materials used. And the figures *must* correspond to the exact amounts called for.

UNIFORMITY HELPS YOU

When you use CINCINNATI (PD) WHEELS you can plan production schedules with the assurance that each reorder wheel will act and grind exactly like the original. This is the promise—and *performance*—of Positive Duplication.

CALL CINCINNATI TODAY

Solve your grinding problems with the help of Cincinnati's factory-trained specialists. Their wide experience in job set-ups and grinding operations is at your service. Just call your CINCINNATI (PD) GRINDING WHEEL Distributor, or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

(PD) POSITIVE DUPLICATION

CINCINNATI°
GRINDING WHEELS

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A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

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WHEREVER ABRASIVE OPERATIONS ARE PERFORMED

Editor's Page

FEBRUARY 1960

The Advantage

We are looking for "The Advantage." Every business, every company, every department, every foreman, every operator, in short everyone is looking for an advantage. It is also true that almost everyone has an advantage. This advantage may be one point or a combination of points. It is because of this advantage that we have brought out a series on such subjects as gaging, coolant cleaning, surface grinding, cylindrical grinding, centerless grinding, etc. "The Advantage" is one of our reasons for publishing this magazine. Grinding has certain advantages over other metal removal operations.

The over-all look for the editorial contents of this publication is to point out the advantage of abrasive operations. More specifically the cover story for this month points out the advantages of honing.

Honing is a stock removal operation, but has long been considered only as a finishing operation. Finish and accuracy have been the advantages for honing. By bringing you the honing series we hope also to point out the advantage honing has in stock removal.

This may appear to be a desertion of internal grinding in the case of honing I.D.'s but it is not. There are many cases where internal grinding has the advantage over honing and these will be brought to light when we run a series on internal grinding. We do not intend to make direct comparisons between two methods except in generalities. As you all know every application has many ramifications and when something more specific than generalities is discussed the ifs, ands, and buts can become involved. The more specific comparisons must be made by you. You are the only one who knows all the facts.

If from this series you go out immediately and start buying honing equipment, we have done a bad job. If on the other hand, you start evaluating all of your I.D. operations with relation to honing, then we have done the job. We shall continue to bring you the general advantages of abrasive operations so that you may apply them to an evaluation of all your operations and thereby determine "The Advantage."

W. W. Patterson

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4 built-in qualities make G-E Man-Made industrial diamonds better for you!

Here's what they are... Here's what they offer i improved grinding v

1 General Electric Man-Made industrial diamonds are of uniform shape and structure within a given size range. This uniformity, assured by controlled manufacturing processes, results in performance which is consistently superior to that of nature's diamonds.

2 G-E Man-Made diamonds are irregular blocky crystals with rough surfaces – providing extra support in the bond. Unlike smooth-surfaced natural diamonds, they stay in the bond, doing their cutting job, providing longer wheel life, reducing costs.

The proof is in your plant!

A typical comparison between General Electric Man-Made industrial diamonds and natural diamonds proves G-E's superiority *in the plant.* A carbide manufacturer, in cylindrical grinding, used 16" x 2" x 12" straight wheels, vitrified bond, 120 grit, 100 concentration – wet grinding. G-E Man-Made diamond wheel removed 1510 cubic inches of carbide; the natural diamond wheel removed only 928 cubic inches – a superiority of 63% Man-Made over natural!

Your grinding wheel supplier can give you complete information. To get these 4 built-in qualities, specify General Electric Man-Made diamonds (Type RVG) for all resinoid and vitrified grinding wheels. *Metallurgical Products Department of General Electric Company, 11177 E. 8 Mile Ave., Detroit 32, Mich.*

3 new ing friab wide

in greatly wheel performance

3 General Electric industrial diamonds are more friable than natural diamonds. This means you get sharp new cutting surfaces throughout the grinding process. And G-E has optimized the friability of its RVG diamonds to cover wider applications, heavy downfeeds.

4 General Electric Man-Made industrial diamonds are of controlled, uniformly high quality. Wheels containing G-E Man-Made diamonds are available in abundant supply, and rapid deliveries are assured. Your grinding wheel supplier is the man to see.

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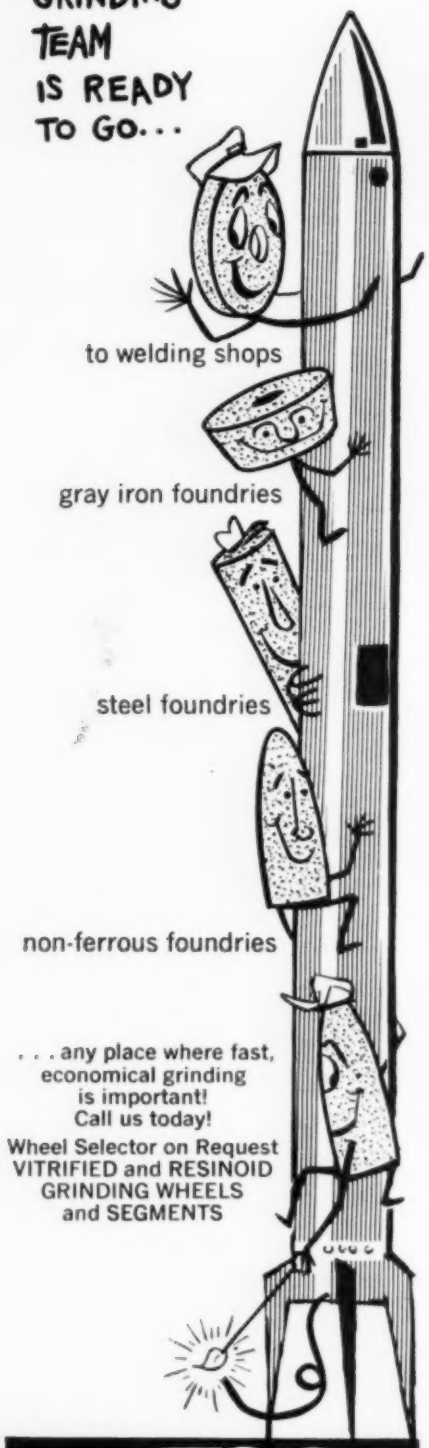

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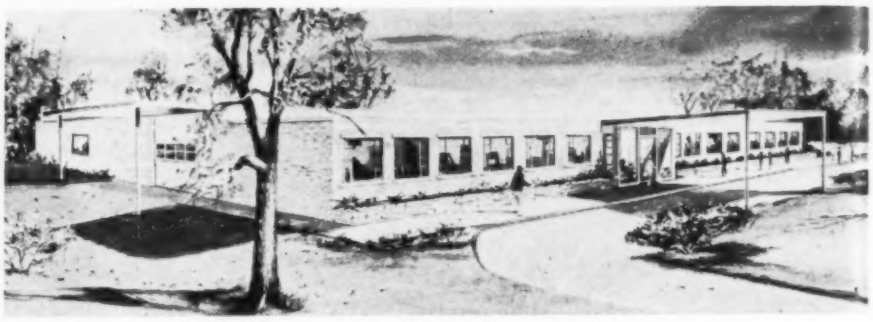
Metalworking in General



Artist's conception of the Superior Hone plant, Erwin, Tennessee.

Superior Hone Builds New Plant

Formal groundbreaking ceremonies were held at the site of the new Superior Hone Corporation plant at Erwin, Tennessee, recently. When completed, about April 1, the plant will contain 15,000 square feet of floor space, will employ about 50 persons.

Main offices, development work, and facilities for special runs will continue at Elkhart, Indiana.

Vanadium Tubing Extruded

Successful experimental extrusion of commercially pure vanadium was recently announced by the Wolverine Tube Division of Calumet & Hecla.

Seamless vanadium tubing is expected to be particularly valuable in the nuclear and process industries because of the unusual combination of lightweight, high temperature strength and corrosion resistance.

Use of Aluminum in Cars Will Jump in 1960

Aluminum applications in automobiles will make another significant advance in the 1960 model year, with an estimated per car increase of 13%, according to a prediction by **V. E. Flaherty**, automotive industry manager for Kaiser Aluminum & Chemical Sales.

Acheson Hall, Chemistry Center, Dedicated at Buffalo University

Edward Goodrich Acheson Hall, a two-million dollar chemistry center for the University of Buffalo, was dedicated recently. **General Clinton F. Robinson**, president of The Carborundum Company, delivered the dedicatory address.

The building is named in honor of the late Dr. Acheson, inventor of silicon carbide and founder of The Carborundum Company in Niagara Falls, N.Y.

Diamond Sales Hit New All-Time High

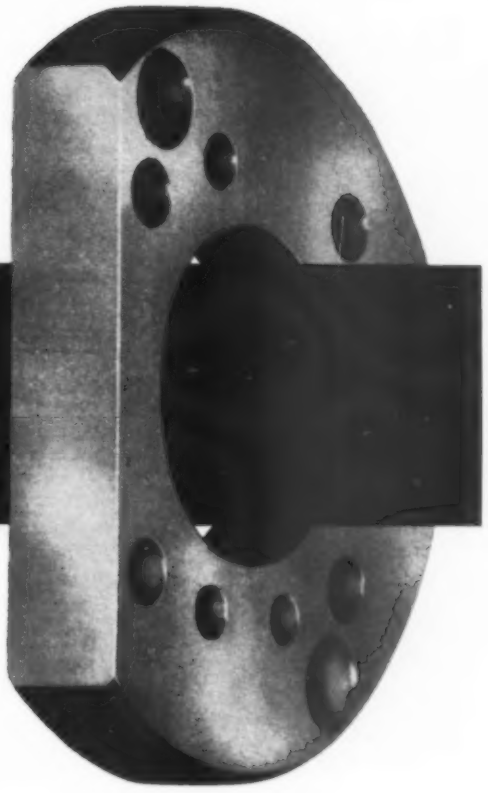
More diamonds were sold in 1959, both gem and industrial stones, than in any previous year in the history of the African diamond industry, according to year-end reports issued by Central Selling Organization in London.

Total sales of gem and industrial diamond amounted to $255,180,640 (91,135,943 pounds sterling). This represents a 39 per cent increase over total sales in 1958.

Standardization Stimulates Sizable Savings

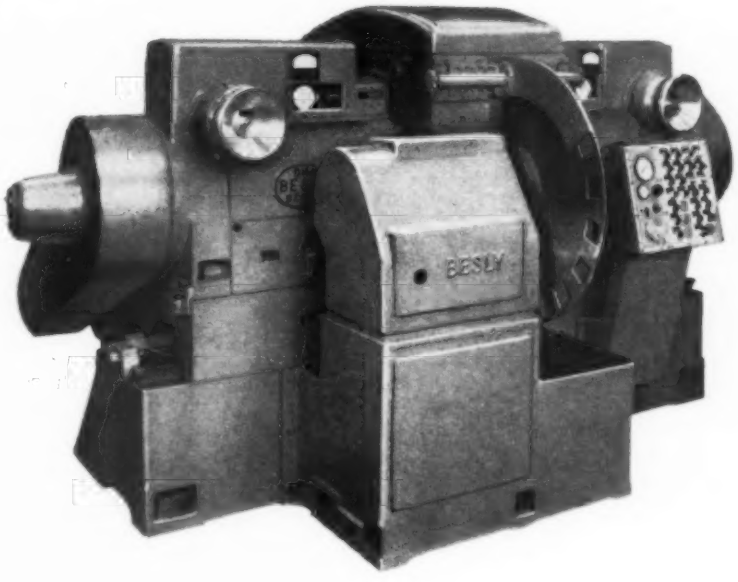
Savings reported for each dollar spent on standardization ranged as high as $50, averaged close to 1% of sales, according to a recent survey of standardization in industry by the American Standards Association. • • •

How's this for accurate grinding?



Very dense cast iron COMPRESSOR CYLINDER, 3⅞" dia. x ½" was *production ground* by a BESLY DH4 grinder to ± .0001" of size and .000050" of flatness and parallelism. Stock removed was .0014" to .002". Finish was 8 micro-inch. Rate of production: 240 cylinders per hour. *Tolerances exceeded specifications by more than 100%!*

If your grinding equipment can't turn out such results...**Better see Besly!**



BESLY DH4 double horizontal spindle disc grinder. Has *exclusive* precision quill and clutch infeed that provides feed increments calibrated in *millionths.* Abrasive discs can be changed in 30 minutes without disturbing setup, *cutting downtime in half.* Dressing time is only four minutes, *1/5 the usual time!* Simplified push-button operation and controls, built-in dials, gages and meters to indicate abrasive conditions, movement and alignment, motor load, etc., assure precise results, dependable grinding production.

Get all the facts. Write for the Besly DH4 Bulletin, Now!

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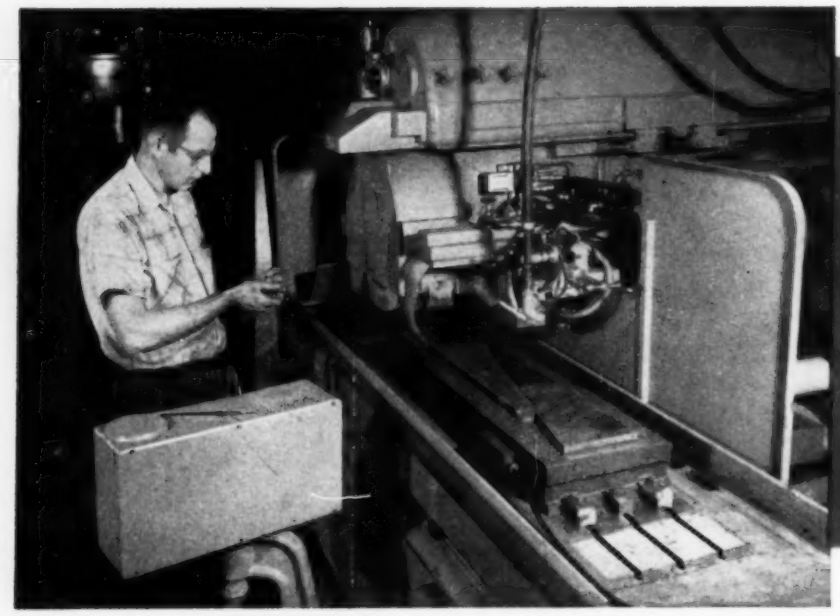
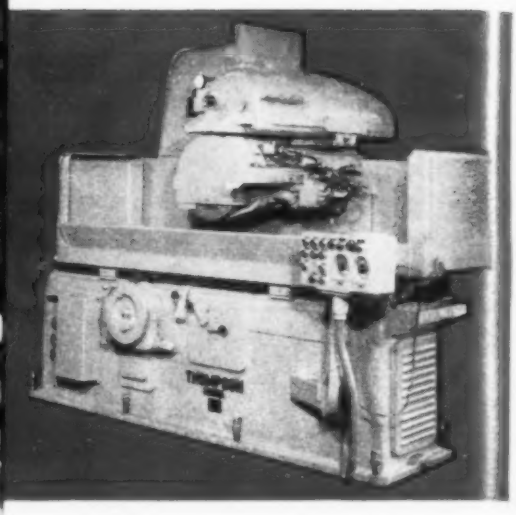
THE NEW THOMPSON PLUNGE-MATIC SURFACE GRINDER





COMPLETELY AUTOMATIC

With the new Plunge-Matic, Thompson now offers a plunge feed machine for those surface grinding jobs where the area to be ground is constantly covered by the grinding wheel width. Designed for fast production, the Plunge-Matic is completely automatic—including downfeed, wheel dressing and automatic compensation.

Shown above is one of four Plunge-Matics in use at the Disston Division, H. K. Porter Company, Inc., grinding high quality hand saws. The saws are held on tapered flux bars or magnetic shims and the wheel face is dressed straight with an automatic power operated wheel truing device. The four machines are equipped with a pre-selected variable downfeed arrangement which automatically decreases the downfeed rate as the contact area of the work increases. The wheel heads are also equipped with oscillating crossfeeds. Being completely automatic in their cycles, the four machines require but two operators who load and unload only.

Constant Accuracy is Assured by Hydra-Cool

All Thompson Plunge-Matics are made in various types and sizes to meet all job requirements. All machines of 40 inches and up in work length are equipped with the Hydra-Cool Hydraulic System*—the exclusive Thompson feature which eliminates all heat distortion throughout the machine.

* PAT. APPLIED FOR

The new Thompson Plunge-Matics are designed to grind contoured as well as flat surfaces with equal efficiency. The three drawings at right represent but three of many contour jobs which Thompson Plunge-Matics are now handling successfully.

Send for descriptive folder on this new Plunge-Matic surface grinder.

Thompson SURFACE GRINDERS

SPECIFICATIONS

GRINDERS:	Thompson Type C 12″x16″x-48″ Plunge-Matics
WHEELHEAD:	40 HP
WHEEL:	20″x8″x12″
STOCK REMOVAL:	Approx. .010″ from each side
PRODUCTION RATE:	60 saws every 50 minutes from 2 machines with one operator

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for fast action and long life

SIMONDS SNAGGING WHEELS

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Right for you . . . for rapid metal removal and long wheel life. With Simonds snagging wheels, that is *consistently* true, from order to order. They're made for all portable grinders . . . air, electric or flexible shaft . . . straight wheels, cup wheels, cones and depressed center wheels. Resinoid bonded for high speeds up to 9,500 s.f.p.m. Vitrified bonded for regular or low speeds up to 6,500 s.f.p.m.

Improved resinoid bond contains an internal lubricant consisting of special chemicals and compounds added to the wheel mix for improved grinding action.

Write for Bulletin ESA-304

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ACCO for Better Values

With this Campbell Machine, you can--

Cut 6-inch Diameter Hard Alloys-Cleanly and Accurately-in Less Than 3 Minutes!

• This Campbell wet abrasive cutting machine—the Model 406—will cut tubing, bar stock, angle iron, or any other shape up to 6″ round or square—and it will cut practically *any* material, including the new super alloys and exotic metals. Like all Campbell machines, it's designed to give *accurate* cuts, quickly and cleanly.

HIGH SPEED—4 to 8 seconds per square inch is the normal cutting speed for all Campbell wet abrasive cutting machines. For instance, you can cut 6″ diameter hardened steel in less than 3 minutes.

ACCURACY—Campbell machines are production machine tools. They cut within close tolerances to reduce rejects and scrap loss. For example, the Model 406 will cut 3″ diameter material to lengths within ±.010″, 6″ diameter within ±.030″.

FINE FINISH—Additional finishing operations are rarely required. There is no burn, and burr has been reduced to an absolute minimum.

POWER OSCILLATION—On an oscillating-type machine such as the Model 406, the cutting wheel is moved horizontally back and forth *across* the cut as the wheel is fed downward. The result—greater cutting capacity, with longer wheel life.

PROPER COOLANT APPLICATION—Large reservoir and a 33 gallon/minute pump provide high volume of coolant. Unique Campbell distributor applies coolant equally to both sides of the wheel—an essential requirement for accurate cuts.

OTHER CAMPBELL MACHINES FOR ANY CUT-OFF NEED

Choose from four types of Campbell machines for wet or dry cutting—chop stroke, oscillating, horizontal or rotary—with capacities up to 14″ rounds, 12″ billets, plate up to 6″ thick and 20 ft. long.

Regardless of your application, you'll find that a Campbell machine provides you with the best cut-off method for modern production techniques—far more efficient, accurate and economical for cutting many materials than other cutting equipment.

WRITE FOR DETAILS—Bulletin DH-260 gives the complete story on the Campbell Model 406 abrasive cutting machine. We'll also be glad to send you information on other machines; just tell us your cut-off application. And remember—your Allison-Campbell Field Engineer is an abrasive cutting specialist. Call on him for expert advice.

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CAMPBELL ABRASIVE CUTTING MACHINES

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You Asked . . .

ARTHUR RAKESTRAW
Contributing Editor

Grinding Holes in End Mills

• What grade of grinding wheel would you recommend for the most efficient ID grinding of ⅛" to ¼" diameter holes in HSS end mills? Please give wheel sizes and specifications.—J. M., Plymouth, Michigan.

The grinding of the small holes in the ends of end mills seems a bit unusual. We have checked with several tool shops in this area to make sure, and find that they never grind the center hole. It simply serves as clearance for the wheel while the end cutting surfaces are being sharpened.

However, because of the very small wheel size involved, a mounted wheel or point is suggested. Of course it would be necessary to use a high-speed spindle (up to 100,000 rpm) with a collet chuck to accommodate the wheel spindle.

Inasmuch as it would be necessary to provide such a set-up for the ⅛" diameter wheel, we suggest that you use the same type for the ¼" diameter size.

Suggestions for these wheels are:

Shape W-145, ⅛" x ⅜" wheel mounted on ⅛" x 1½" spindle.

Shape W-162, ¼" x ⅜" wheel mounted on ⅛" x 1½" spindle.

Specifications for both wheels to be 80 or 90 grit, in a premium type abrasive, grade K, vitrified. We suggest that you check with your abrasive supplier as to the amount of overhang (length of wheel and spindle protruding from the collet chuck). This is most important in that a very slight deflection of the spindle, if the overhang is too great, will result in a broken wheel and a bent wheel spindle.

See also "Mounted Wheels—Versatile Production Tools," GRINDING and FINISHING, May, 1959, p. 28.

Diamond Wheel Testing

• What would you recommend for nondestructive testing or analysis of diamond wheels for the purpose of comparing wheels made by different manufacturers? The wheels are used for grinding carbide tools. Because of the high cost of the wheels it is not very economical to conduct actual grinding tests.—R. H., Lowell, Massachusetts.

My best suggestion would be that you contact the diamond wheel manufacturers in whose products you are interested and advise them of your contemplated testing plan. You should experience no difficulty in obtaining a trial wheel such as they would recommend for your particular method of carbide grinding.

Because of the varied shapes and sizes of carbide tipped tools usually found in a single plant, it is rather difficult to run a test on production tools. Many acquaintances of mine confine their testing to the diamond wheel cost for a definite amount of solid carbide. Such a test should not involve a long testing period.

Even though it became necessary to purchase several diamond wheels, the wheel cost would hardly be excessive. You undoubtedly would gain considerable data from the use of the wheels under your normal tool sharpening methods.

For another viewpoint on this subject, see "Accurate Shop Testing of Diamond Wheels," by John W. Ripple, GRINDING and FINISHING, November, 1959, p. 46.

Centerless Grinding of Flat Washers

• How can I through-feed flat washers on a centerless grinder so as to grind the flat sides?—S. S., Lansdale, Pa.

There is no possible way in which a centerless grinder could be used to surface grind the flat sides of flat washers.

The only possible grinding set-up that would permit through-feed of the washers would be a double disc grinder. Washers can be through-fed between the opposing discs through a chute, and the operation could be accomplished in one pass, providing the washers were of approximately equal thickness. If there is a considerable variation in washer thickness, several passes might be necessary.

Other surfacing methods would involve the use of either vertical spindle or horizontal spindle surface grinders. In either case, washers would be nested on a magnetic chuck and surfaced one side at a time.

Of the two, the vertical spindle grinder would probably be most economical. The comparatively larger magnetic chuck would accommodate a larger quantity of washers, and the broad surface contact of the grinding wheel would result in faster production than would be possible with a horizontal surfacing set-up. • • •

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INFEED GRINDER CONTROL SYSTEM

HOLDS WORK TO .0002" IN PRODUCTION QUANTITIES

(To .000070" On Parts Smaller Than ½")

Electronic unit continuously monitors position of slide relative to workpiece in order to obtain predetermined finished size . . . Variations in size of workpieces do not affect finished size . . . Compensation for wheel wear and variations in machine elements and operating conditions can be made without shutting down the machine . . . A single control knob permits adjustment for size while grinding is in process.

INCREASES OUTPUT OF EACH WORKER AND MACHINE

Pre-grinding operations are eliminated . . . Speed and ease of set-up reduces downtime.

CUTS DIRECT AND INDIRECT GRINDING COSTS

Higher production per machine and per worker and elimination of "rough grinding" time means that fewer grinders and fewer workers are required to maintain existing production requirements.

635-C

The Bellows-Airborne Infeed Grinder Control System consists of a modified MICROtrol Control Unit, manufactured by the Airborne Instruments Laboratory division of Cutler-Hammer, Inc., linked to a special Bellows Grinder Feed. Designed primarily for use with a Cincinnati #2 Centerless Grinder in applications where the part is not ground over its entire length (such as headed pins, rounds or pins of divided diameters, or parts which cannot traverse between the wheels), the unit offers both coarse and fine feeds and can be set for either continuous cycling or single cycle operation.

For complete information, without obligation, write Dept. GF-260, The Bellows Co., Akron 9, Ohio.

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Grinding non-ferrous materials to fine tolerances!

This leading manufacturer of electronic systems uses new hard ceramics as microwave system components. These extremely tough materials presented a difficult grinding problem. It was solved by using diamond abrasive wheels on Blanchard No. 11 grinders. The results were outstanding: Disks measuring approximately 2¼" x ¼" were ground to a tolerance of ±.001", with ⅛" of material removed. Flatness is .002", parallelism .002". These parts are ground at the rate of 48 per hour, and surface finish is consistently excellent.

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THE BLANCHARD MACHINE COMPANY
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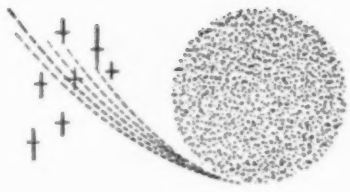


Ideas from the Shop

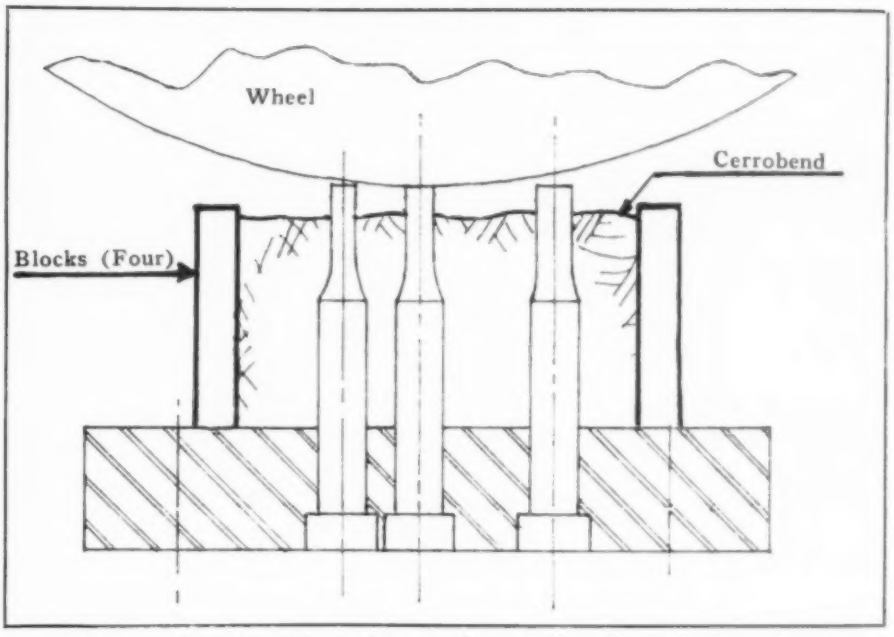
Grinding Small Punches

By George C. Bennett

• To provide rigidity and eliminate vibration in grinding small punches and thin projecting sections of parts, we make use of Cerrobend, a low-temperature alloy which melts at 150° F. This gives us a better grinding finish on the punches in less time.

In setting up for grinding, the operator surrounds the punches with four blocks of material to provide a well for the Cerrobend. No fastenings are required. He pours in the Cerrobend, allows it to set, removes the blocks.

After the grinding, he removes the Cerrobend either by dropping the part into hot water or by using a small torch. The part is left neat and clean.



Cross-section of small punch set up for grinding. Since the Cerrobend is liquid when it is poured into the well around the punches, it fits closely around them, comes to a uniform height.

Quick-Setting Tip For Surface Grinders

By K. G. Dixon

• We use our surface grinder for many short pieces of varying lengths. To speed up the setting of the trip levers or stops, we used two strips of brass 1" x 24".

One piece was marked with 23 lines one inch apart. The center line was marked zero, and the others 1, 2, 3, 4, etc., on either side of the center. This strip was attached to the side of the 24" chuck with drive screws.

The other strip was marked in the same way, except that for this grinder the location of the mark we put on the trip lever made it necessary to allow 1½" between the center line and the first marks on either side of it. The other marks are all one inch apart.

This strip was attached to the machine, and corresponding marks were made on each trip lever.

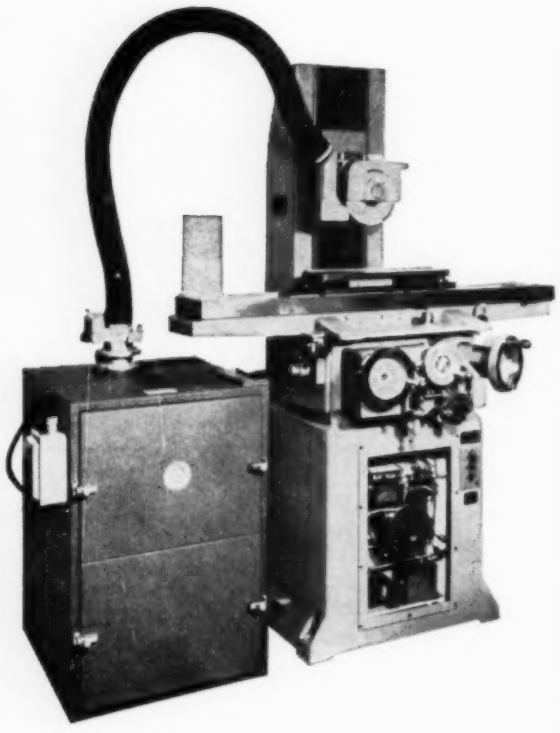
Now when an operator places on the magnetic chuck a piece to be ground, he needs only to glance at the numbers on the chuck at either end of the piece, set the trip levers to the corresponding numbers, and the machine will change direction accordingly.

Multiple Dog Wrench Attached to Grinder Tailstock

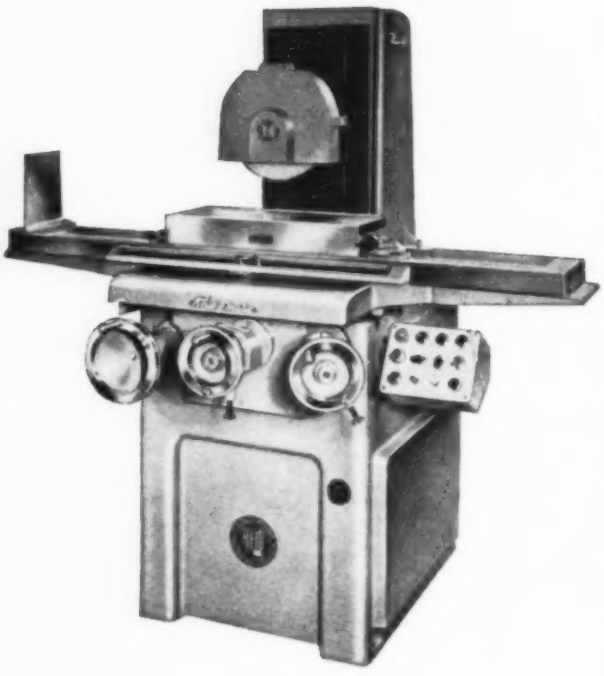
By H. J. Gerber

• We have attached a various sized dog wrench to our cylindrical grinder tailstock to facilitate the locking and releasing of drive dogs on work being processed. This arrangement has proved to be a great convenience as there is no need to hunt for the right wrench and the operation can be performed with one hand.

To make this device we simply cut off the handles of a number of old tool post wrenches, welded the wrench ends to a small steel plate, and attached this plate to the top surface of the tail sock with two machine screws. • • •



MODEL 618 P
with dust collector



REID-O-MATIC 824 . . .
fully automatic

Industry's number one choice . . . for toolroom and production economy!

The vast number of REID *precision* surface grinders, in all kinds of industry, is the best proof of their outstanding quality.

In the 618 class these different models are available; a 618 P with power operated table and cross feed — a 618 PT with power table and hand operated cross feed — and a completely manual grinder, the 618 H. Automatic lubrication and a Cross Slide Lock are included on REID grinders as standard equipment.

The REID-O-MATIC is a fully automatic, all electric, surface grinder with a capacity 8″ wide, 24″ long and 21″ from the table to the center of the spindle.

For your production and toolroom grinding, REID surface grinders offer the maximum in convenience, quality and economy.

Accessories can be furnished for wet grinding, cool grinding, dust collecting and other needs.

Complete specifications will be sent on request.

PRECISION SURFACE REID GRINDERS

Manufacturers of precision surface grinders for production and toolroom needs

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American Society for Abrasives

Western Michigan Chapter

Charles J. Hennesen heads the chapter for 1960 as chairman, with **Paul Starks** as vice-chairman and **Robert Stratford** as secretary-treasurer. Following their election at a recent meeting, the members and their guests viewed a series of sound color slides entitled "Machine Applications of Coated Abrasives," presented by **John Simmons**, of Sundstrand-Engelberg Corporation.

Chicago Chapter

The January meeting of the Chicago chapter was notable for setting two records. One was a record attendance of eighty members and guests. The second, the fourth consecutive occurrence of bad weather for the meeting.

The speaker was **Gilbert R. Blake**, product safety engineer, Norton Company, on "Grinding Wheel Safety."

After a few introductory remarks concerning the humanitarian and financial reasons for promoting safe operation of grinding wheels, Mr. Blake presented a film on the subject, which emphasized the reasons behind the safety code regulations.

The speaker at the next meeting, Thursday, February 11, at Nielsen's Restaurant, 7330 North Avenue, Chicago, will be **Robert C. Fisher**, manager of abrasive engineering, Cincinnati Milling Machine Company, Grinding Wheels Division, on the subject, "Inside and Outside the Grinding Wheel."

A. L. Ball, technical consultant, Bay State Abrasive Products Company, Westboro, Mass., will speak in March on grinding wheel applications.

Past and present officers of the Detroit chapter. From left to right: P. J. Russ, Jr., National Grinding Wheel Sales; Leland Pruett, Ford; E. Sorensen, Detroit Transmission; Emil Vogeley, Cincinnati Milling Machine Co.; J. H. Gills, Carborundum; Dennis Hurley, Brown Star Products; R. W. Hall, Chrysler Trenton; Cal Edwards, Ford Motor Co.; R. E. Englund, Waltham Grinding Wheel Co. Missing from the picture are F. Schlie, Detroit Transmission; and F. Teska, Macklin Company.

Pittsburgh Chapter

The December meeting of the chapter was a Christmas party held on the 17th at the Pittsburgh Athletic Association.

Members and their wives were invited for a cocktail hour, dinner and dancing.

Long Island Chapter

A departure from the conventional monthly meeting pattern was the Long Island Chapter's Bonded Abrasive Seminar, held January 25, 26, and 27, 7:00 pm, at the Long Island Agricultural and Technical Institute, Farmingdale, New York.

Kenneth Bates, field engineer and instructor in the Bonded Abrasive training program of the Norton Co., Worcester, Mass., was the leader.

The topics covered in the seminar were: selection and use of grinding wheels; grinding high alloy metals; and grinding vs. machining.

Tickets were $3.00 for members and $5.00 for non-members. • • •

Kenneth L. Bates

CARBOTROL

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The largest selection of nuggets (15 new sizes), triangles in thick and thin styles, cylinders, pellets, etc. on the market.

A fresh approach to the compound problem, offering many new types to meet the changing finishing needs of industry.

A broad line of standard machines to meet any finishing application.

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FOR FASTER, more uniform metal finishing *at low cost*... for a reliable, single source of supply of processing materials and equipment ...and unbiased counsel on *any* parts finishing problem, you can count on CARBORUNDUM. The exclusive barrel finishing technique developed by CARBORUNDUM now makes possible optimum standards of precision metal finishing. It permits scientific control of most finishing variables and at economies never before dreamed possible. It will pay you to look into CARBOTROL 7 today! A staff of trained specialists and distributors is ready to assist you.
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Design for Grinding

RICHARD L. McKEE • Associate Editor

Design . . .

For What Type of Grinding?

● A number of writers in the field of metal removal give the impression that grinding is a single method, on a par with the sub-divisions of single-point machining. Thus, you often find a list like this: ". . . turning, milling, planing, grinding . . ."

This is not entirely accurate. There are probably as many sub-divisions of grinding as of single-point machining. For instance, a flat surface may be roughed and finished by surface grinding, by disc grinding, by flat polishing with abrasive belts, to mention three common ways.

Cylindrical surfaces may be ground on either a centerless or a cylindrical grinder. In either case it is possible to do the operation with wheels or belts. Abrasives may be used in deburring in at least half a dozen different ways.

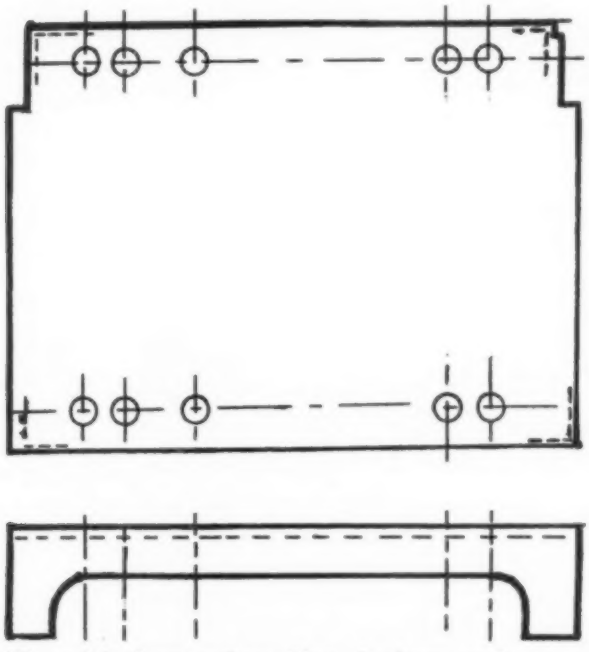
The choice of grinding method depends on many factors, more than there is space to discuss here.

All abrasive methods, however, have two characteristics in common, which set them off from all single-point machining:

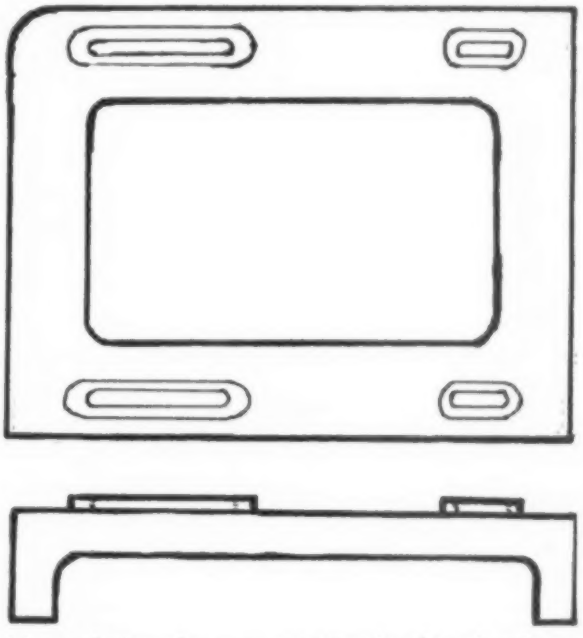
Interruptions in the surface cause no problems.

No minimum amount of excess stock is required. The closer the rough piece is to finished size, the better. Abrasives can achieve a high rate of stock removal, but do not need much excess stock to operate efficiently.

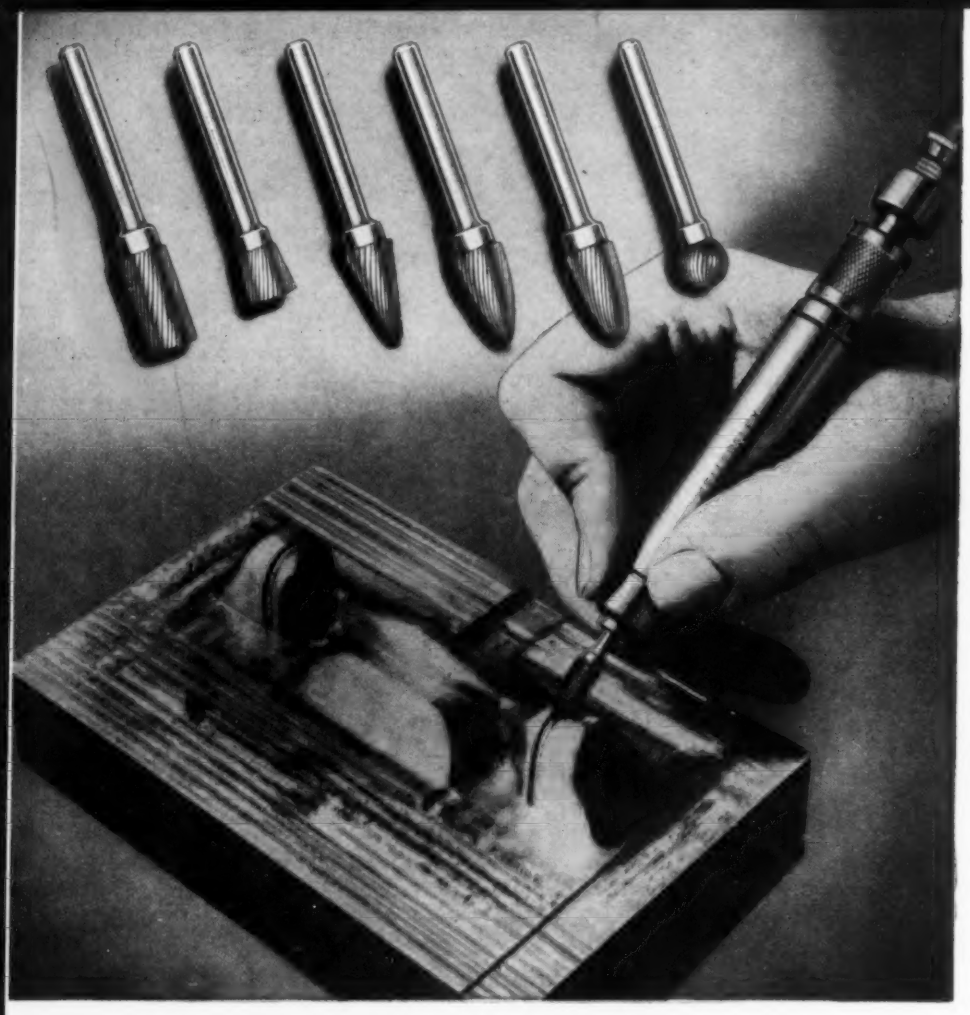
(continued)



The original motor base. Note the large surface on top, nearly 100 square inches, to be finished.



After redesign, the area requiring finishing has been reduced to the four bosses around the slots.



For Faster, Finer Finishing . . .

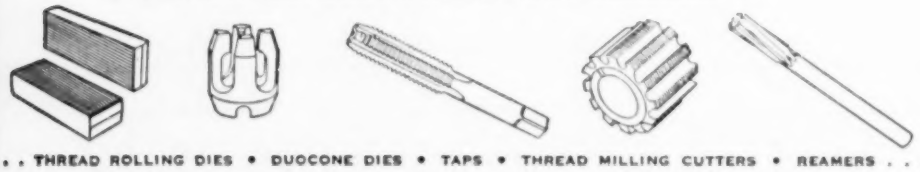
NEW KELLERFLEX

HIGH SPEED AIR TOOLS

These new air tools are compact, lightweight units that give you speeds up to 60,000 rpm and the power under load you need to remove hard-to-machine alloys faster and produce finer finishes. Teamed with the smaller sizes of P&W Kellerflex Carbide Burs, these smooth-running tools will help you save time and improve work quality on a variety of finishing operations on castings, dies and many other types of work.

Kellerflex Air Tools are supplied in 3 models that provide 20,000, 40,000 and 60,000 rpm respectively. All are perfectly balanced for easy operation with one hand. Built to meet rigidly high P&W standards for precision, quality and dependability, they are easily hooked up to your present air lines.

Write now for complete information on the new P&W Kellerflex Air Tool . . . and on P&W Master Machine Ground Carbide Burs. Pratt & Whitney Company, Inc., 6 Charter Oak Blvd., West Hartford, Connecticut.



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These two attributes of grinding provide the basis for the three prime requirements in design to favor grinding, regardless of the final method selected.

1. The amount of metal to be removed should be held to the lowest possible figure.

2. The areas of plane surfaces to be finished should be kept as small as possible.

3. Surfaces to be finished must be accessible to some form of abrasive.

The motor bracket sketched on the previous page is a simple example of this thinking.

The original design, on the left, had an unbroken area of nearly 100 square inches, requiring 24.7 hours to grind 100 pieces.

A study of the piece showed that only the surfaces on which the motor was mounted needed to be finished.

In the redesign, the major changes were the substitution of four slots, each surrounded by a raised boss, for the ten bolt holes, and the elimination of a large area in the center of the top surface. Neither change affected the strength of the base.

The piece had formerly been finished on a surface grinder, and of course could have been continued on that machine at a considerable savings in time. The reduction in finished surface, however, was sufficient to permit it to be processed on a disc grinder in a still shorter time.

The time for grinding after redesign was 1.3 hours per 100 pieces, a 95% saving.

Auxiliary economies were a substantial saving in material, as well as a possible reduction in assembly time caused by the substitution of slots for the bolt holes • • •

(Adapted from parts of Chapter 28 of THE GRINDING WHEEL, Revised Edition, 1959, published under the auspices of The Grinding Wheel Institute.)

"Biggest job we've ever tackled!"

AMERICAN'S *NEW* DISHED DEPRESSED CENTER WHEEL

Compare these Features....

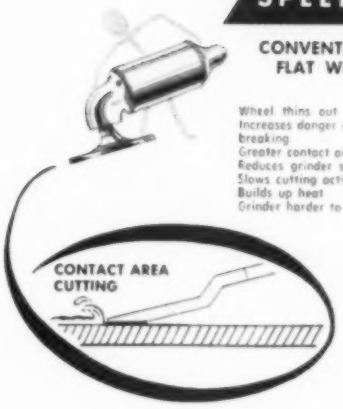
Ruggedly reinforced with three full layers of fiberglass permanently resin-bonded and molded to shape. "American's" new Dished-Depressed Center Wheels possess unusual strength and resistance to breakage having nearly a 2:1 safety plus ratio over conventional depressed center wheels. This improved safety factor is made possible by the third full layer of fiberglass fabric, reinforced molded throughout the important bottom side — the most critical area that must withstand the greatest stress while grinding. This unique feature alone will appeal to the safety conscious wheel buyer who demands fast cutting performance along with long wheel life economy.

CALL YOUR SUPPLIER OR WRITE

SPEED *(fast removal of metal)*

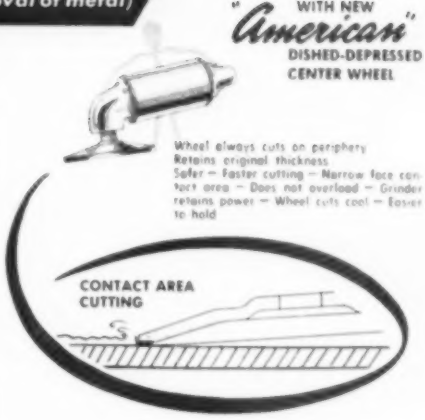
CONVENTIONAL FLAT WHEEL

Wheel thins out at edge
Increases danger of wheel breaking
Greater contact area
Reduces grinder speed
Slows cutting action
Builds up heat
Grinder harder to hold



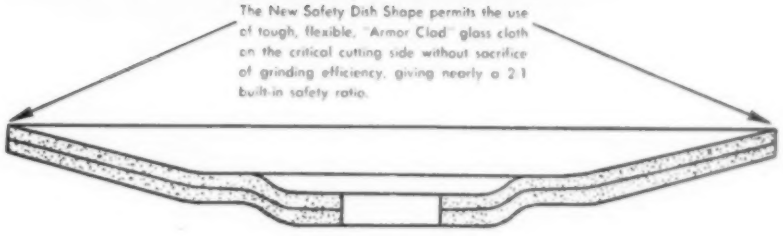
WITH NEW "American" DISHED-DEPRESSED CENTER WHEEL

Wheel always cuts on periphery
Retains original thickness
Safer — Faster cutting — Narrow face contact area — Does not overload — Grinder retains power — Wheel cuts cool — Easier to hold



SAFETY

The New Safety Dish Shape permits the use of tough, flexible, "Armor Clad" glass cloth on the critical cutting side without sacrifice of grinding efficiency, giving nearly a 2:1 built-in safety ratio.



CONVENTIONAL FLAT WHEEL
CONTACT AREA SMOOTHING AND CLEANING

Generally considered an unsafe practice
Dangerously thins wheel
Kills power — slows operations

WITH NEW IMPROVED "American" DISHED- DEPRESSED CENTER WHEEL
CONTACT AREA SMOOTHING AND CLEANING

Safe operation — wheel thickness is maintained
Narrow contact area — cuts faster. Minimum power loss. Easier operation.

Always use a Guard . . . for purpose of clarity the Guard was not included in these illustrations.

COMFORT

with CONVENTIONAL FLAT WHEEL

awkward — tiring requires added pressure to make cut

WITH NEW "American" DISHED-DEPRESSED CENTER WHEEL

Provides more comfortable performance — easy to use with little pressure required to get cutting action or hold grinder steady.

"American" EMERY WHEEL WORKS

PROVIDENCE 1, RHODE ISLAND

Use postpaid card. Circle No. 220

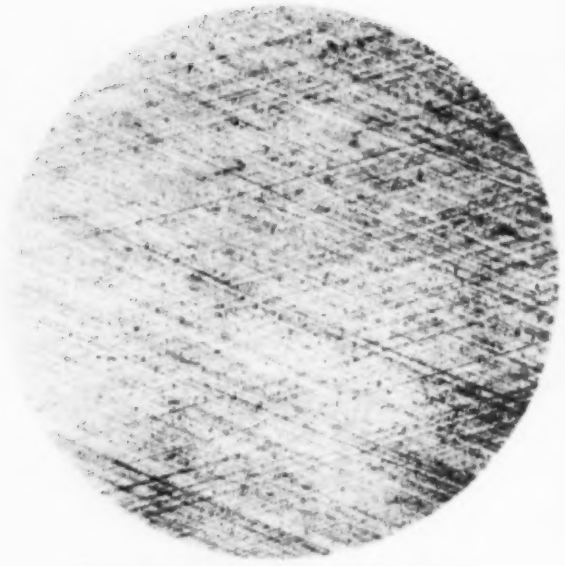


Figure 1. Typical cross-hatch pattern developed by honing.

WHY HONING?

This is the first of a series of four articles which will cover the honing process. The first part will describe the method, fundamentals, advantages and applications. Other parts will cover how to apply, machines and equipment, and pitfalls, errors and corrections.

PART 1

By M. M. PATTERSON
Managing Editor

● Honing is a process of abrasive cutting under pressure using reciprocation and rotational movements to obtain stock removal, controlled finishes, accurate size and accurate geometry of curved surfaces. Honing is an operation which has removed as much as 1½ cubic inches of steel per minute while holding close tolerances for finish, size and geometry. Finishes can be controlled anywhere in a range from less than one to 150 microinches. The same method can also hold size and geometric accuracy to millionths.

Honing is an operation which employs slow speeds, high abrasive area of contact and an inherent characteristic to produce fine finishes, accuracy of size and geometry without precise location or equipment.

This is an operation which can machine parts as large as 60″ in diameter and 40′ or longer. Honing has also been performed on I.D.'s as small as .058″ and as short as ⅛″. All types of bores have been honed from ported, slotted, interrupted, tandum, blind, to tapered. Any material can be honed from brass to carbide.

Fundamentals and Advantages

The honing tool consists of a cylindrical steel body or mandrel somewhat smaller than the bore to be honed, bonded abrasive stones or sticks which are inserted into the periphery of the body and a means to expand the stones away from the body. The tool also includes a drive shaft by which the tool is rotated and reciprocated.

The honing machine provides the means of driving the tool for reciprocation and rotation, and in addition in most cases provides the power for stone expansion. If a fixture is required this is also provided as a part of the honing machine.

In relation to other machining operations honing does not require accurate alignment. Most honing operations have either the part fixture in such a way as to allow some lateral float or else the tool is provided with float. The object of the honing process is to have the tool follow the mean axis of the bore. This allows the tool to center itself in the bore by equal pressures of the stone. High spots within the bore are thus contacted first and abraded to size without abrading the low spots over size.

Honing is a low velocity operation with small stock removal per pass; however, due to the large abrasive area of contact and the self-dressing action of the honing method, stock removal is a feature of this process. In comparing honing to internal grinding it must be considered that grinding presents only a line contact of cutting area as compared to the large area of abrasive contact of the stones in any honing operation. The other important point to be considered in any honing operation is the combined directions in which the abrasive particles are presented to the work, thus providing self dressing action and with the self aligning, honing also provides self-truing of the stones.

Chips from honing operations although smaller than single point operations do have the same appearance. Most chips from honing are extremely fine as they have passed between the stone and the work. Pressure or depth of cut of the abrasive depends upon the grit and grade of the stone, finish required and the material being honed. It is not unusual to find grit sizes as large as 80 or even 60 used for stock removal or roughing honing operations.

Today's honing operations are capable of either very fine finish with little stock removal or heavy stock removal with any desired finish. In cases where the bore length is over 24" or if it is four or five times greater than the diameter, honing can remove stock faster than boring and grinding. Bores of short length can be stacked and honed on a production basis.

Finish developed by honing can not be duplicated by any other operation. The lay of a honed surface is in the form of a cross-hatch pattern which has long been considered the finest oil retention surface developed. The very fine cutting action and lack of charging the work surface with loose abrasive produces an excellent bearing surface in that the operation leaves base metal instead of the amorphous metal left as a result of most operations.

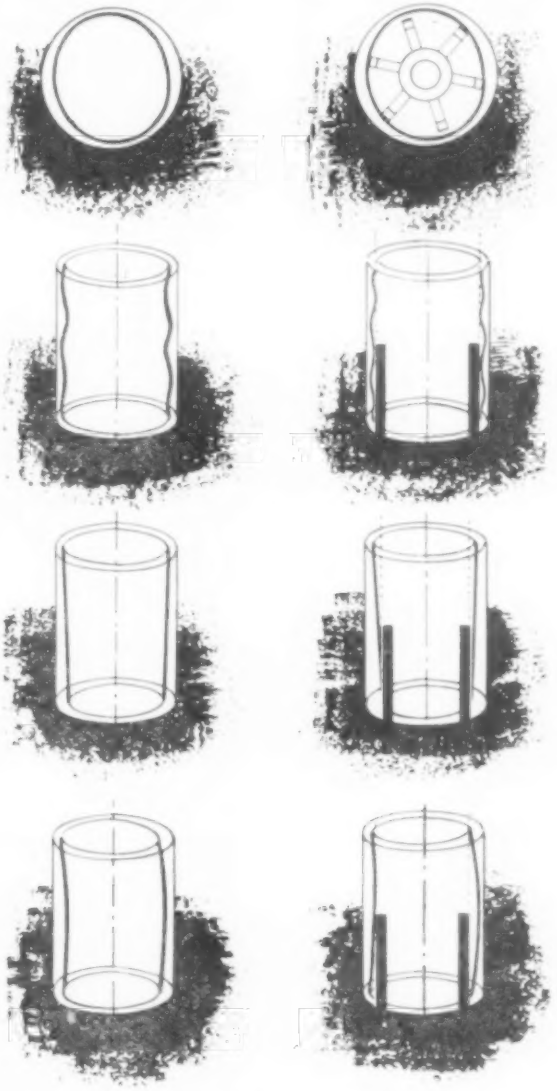


Figure 2. Top views show an out-of-round condition of bore left and how it is corrected by honing right. Next views show correction for straightness. Lower middle views show taper and correction. Bottom views show bowed bore and correction by honing.

The physical or metallurgical state of the surface for a depth of from .015 to .020" which results from the machining operation is receiving increased attention. The slower cutting speeds of honing, 200 SFPM considered average, are less apt to damage or alter the metallurgical characteristics of the surface upon which it is working.

The angle of the cross-hatch can be controlled by varying the rate of reciprocation while the rotation is held constant or vice-versa. The depth of the scratches can be controlled by the grit size of the abrasive, the grade of the stone, the honing pressure, the surface speed of the abrading elements and the viscosity of the coolant.

Accuracy developed by honing is often fantastic. Diameters are being held in production to within .0002". Geometry of the bores can be held to even closer tolerances. The reasons behind the unusual accuracy of honing are the floating of either the part or the tool, equal pressure of the abrasive in the bore and relative small amount of stock removal per pass.

While the honing process will not change the location of the bore, it will correct out-of-roundness, taper, bell-mouth, bowing, or barrel shaped bores. The ability of honing to produce these corrections and hold the accuracy is due to the equal pressures and floating action as noted above and also to the tool design and reciprocation. These last two effect geometry of the part. Design of the tool should be such that the honing stones are long enough to bridge the error in the length of the bore. Here again the stone will remove the high spots of the bore first without going over size in the low spots. If it is not practical to design the tool with stones of sufficient length to remove the defects, the stroke of the tool can be altered to develop more passes over the high spots than the rest of the bore.

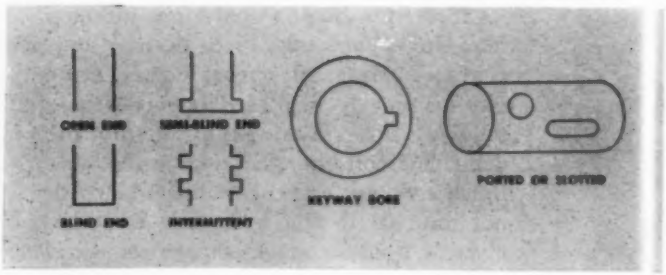
Still another advantage of the honing operation is the relatively small amount of skill required by the average honing operator. The inherent characteristics of the honing process provide the accuracy and repetition rather than the operator skill.

Success of any method depends on economics. The problem of processing any part is to obtain the finished form at the least possible cost. Costs are made up of many factors: the most important are labor (operator and maintenance), expendable items (abrasives), material lost to scrap and production rate (stock removal). For cylindrical

shaped parts either I.D. or O.D. honing has proven to be most economical by being favorable in most of these factors.

Applications

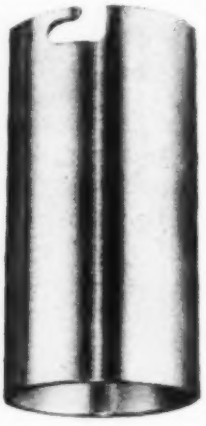
Honing is applicable to any curved surface although most honing is performed on cylindrical surfaces either I.D. or O.D. Honing can be performed on any material which can be abraded. Honing is also relatively unaffected by interruptions in the bore or surface. The following case histories will provide an indication of the range of honing applications.



Shown above are various types of bores that can be successfully honed.

VARIOUS MATERIALS

Hole dia: .000"
Length: ¾"
Tolerance: .0002"
Finish: 16
Material: Graphite
Previous oper.: None
Stock Removal: .008-10"
Production: 120 per hr.
Part: Bushing
Why honed: Accuracy, finish and low cost



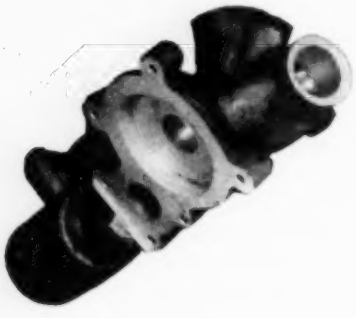
Part: Dashpot tube
Hole dia.: 1.338"
Length: 3"
Tolerance: .0001"
Finish: 16
Material: Brass
Previous oper.: None
Stock removal: .002-8"
Production: 15 per hr.
Why honed: Fastest way to hold tolerance and finish on thin-walled part.

Part: Valve housing
Hole dia.: 1.376"
Length: 6⅝"
Tolerance: .001" roundness and straightness .0002"
Finish: 12
Material: High tensile iron
Previous oper.: Broach
Stock removal: .001"
Production: 15 per hr.
Why honed: best process

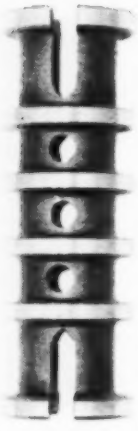
Part: Syringe barrel
Hole dia.: .500"
Length: 4"
Tolerance: .0002"
Finish: 12
Material: Glass tubing
Previous oper.: None
Stock removal: .003-11"
Production: 55 per Hr.
Why honed: low cost, fastest, eliminate selective fitting.

INTERRUPTIONS

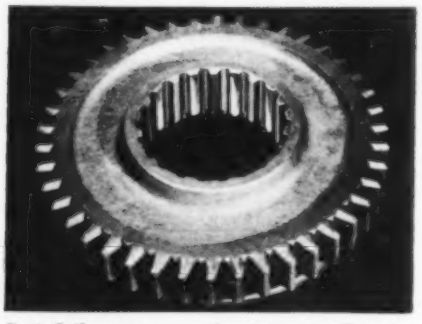
Part: Slow speed gear
Hole dia.: 1.291"
Length: 2½"
Tolerance: .001"
Finish: 45
Material: Steel
Previous oper.: Broach
Stock removal: .0002-.0015"
Production: 45 per hr.
Why honed: correct heat treat distortion



Part: Valve block
Hole dia.: .875"
Length: 6¼"
Tolerance: .0002"
Finish: 30
Material: Magnesium
Previous oper.: Ream
Stock removal: .005"
Production: 12 per hr.
Why honed: Straightness and roundness.



Part: Valve body
Hole dia.: .625"
Length: 3⅜"
Tolerance: .0001"
Finish: 6
Material: Stainless steel, 55-58 Rc
Previous oper.: Grind
Stock removal: .0015
Why honed: Tolerance and finish.

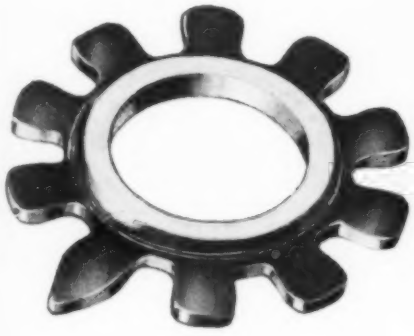


Part: Spline gear
Tolerance: .0003"
Finish: 15
Material: Steel 60 Rc
Previous oper.: Broach
Stock removal: .006"
Production: 45 per hr.
Why honed: Accuracy and finish.

HARD MATERIAL

Part: Valve sleeve
Length: 2 5/32"
Tolerance: .0002"
Finish: 10
Material: Nitralloy 67 Rc
Previous cper.: Ream
Stock removal: .002"
Production: 12 per hr.
Why honed: Free of bow

SHORT BORES



Part: Counter Pinion
Hole dia.: .5636"
Length: 0.1"
Tolerance: .0007"
Finish: 20
Material: Steel
Stock removal: .002"
Production: 1600 per hr. (16 at a time)
Why Honed: Production, accuracy and alignment.

Part: Drawing die
Hole dia.: .750"
Length: 1/16"
Tolerance: .0004"
Finish: 2
Material: Tool steel
Previous oper.: Grind
Stock removal: .003"
Production: 40 per hr.
Why honed: Finish and accuracy

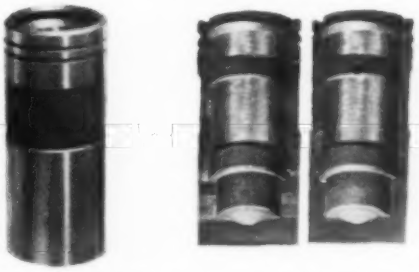
SMALL DIAMETER

Part: Nozzle
Hole dia.: .116"
Length: 2⅛"
Tolerance: .001"
Finish: 5
Material: 308 Stainless
Previous oper.: Drill
Stock removal: .006"
Production: 30 per/hr.
Why honed: Finish

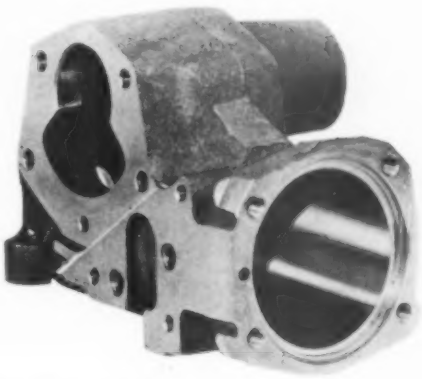
TANDEM BORES

Part: Piston
Hole dia.: .4375"
Length: ¼"
(.¾" each bore)
Tolerance: .002"
Finish: 10
Material: Cast iron
Previous oper.: Bore
Stock removal: .002"
Production: 60 per hr.
Why honed: Alignment at low cost

BLIND-END

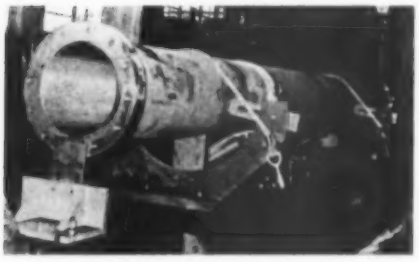


Part: Valve tappets
Hole dia.: .656"
Length: 2"
Tolerance: .0005" (.00003" roundness and straightness)
Finish: 12
Material: Cast iron 60 Rc
Stock removal: .005"
Why honed: Eliminates boring, accuracy.

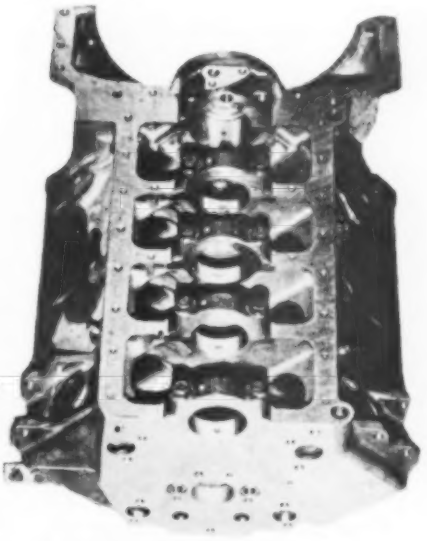


Part: Gear housing
Hole dia.: 3.125"
Length: 6.93"
Finish: 50
Material: Soft iron
Previous oper.: Bore
Stock removal: .002"
Production: 18 sec. ea.
Why honed: Speed, accuracy and finish.

LONG BORES



Part: Tilt cylinder
Hole dia.: 12"
Length: 136"....
Finish: 7
Material: Soft steel
Stock removal: .105"
Why honed: Accuracy, finish and cost.



Part: Engine block
Tolerance: .0005"
Finish: 40
Material: Cast iron
Previous oper.: Bore
Stock removal: .002"
Production: 60 Per hr.
Why honed: Alignment and finish.

This is the first of a four part series which will cover the subject of honing. The next part will describe honing machines, tools and abrasives. Reprints of this series will be available when all parts have been printed. Cost will be $1.00 each for less than 25. Write for quantity prices.

Shown above are some of the 19 swing frame grinders used at U.S. Steel, South Works, for the snagging of stainless steel. (Photos courtesy U.S. Steel)

U. S. Steel Doubles

A new means for applying mechanical pressure to swing frame grinders at U.S. Steel, South Works, has reduced operator effort and almost doubled the rate of snagging performed. Savings is estimated to be $94,000 per year.

By M. M. PATTERSON
Managing Editor

● At the U.S. Steel South Works in Chicago, Illinois, nineteen swing frame grinders handle all the snagging of stainless steel. A means of applying mechanical pressure recently developed by supervisors of the snagging department has resulted in the conversion of five of the nineteen machines. The conversion of the equipment is expected to almost double the rate of snagging performed by the previous equipment.

The recently patented moment arm arrangement on the new swing frame grinder is a mechanically simple arrangement which will, it is estimated, provide for a $94,000 per year savings. The old method consisted of a Fox swing frame grinder using a 20″ x 2½″ x 10″ wheel, on which the standard had been set for 3.3 tons per turn. The Fox swing grinder with a 15 h.p. motor has been considered a basic machine for U.S. Steel South Works. The new machines are still Fox grinders, only they are provided with a 30 h.p. motor, using a 24″ x 3″ x 12″ wheel. The standard for the new machines will be 5 tons per turn. In the use of this equipment it is fully understood that the quality of the slab as

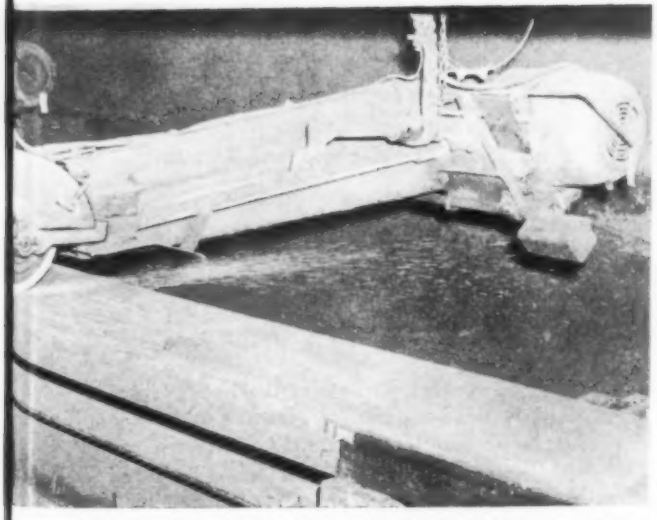
it is presented for snagging, and the operator's skill, will determine ultimate production by this equipment.

Mechanical pressure is developed on the new machines by use of an electrical hoist and a stationary hoist, which develops 300-350 pounds pressure on the wheel. The mechanism is pivoted on the swing frame grinder to a moment arm, the electric hoist being attached in front of the pivot point on the moment arm and the stationary hoist to the rear of the pivot point. The stationary hoist may be altered through several holes in the moment arm to provide for a variation in pressures. By releasing the electric hoist, the moment arm comes to bear on the swing frame grinder, thus providing the pressure for grinding. The stationary hoist is used merely to locate the grinder in relation to the work according to the operator's preference. This mechanical means of pressure has a distinct advantage over the hydraulic as its simplicity and complete lack of maintenance greatly reduce downtime for this equipment.

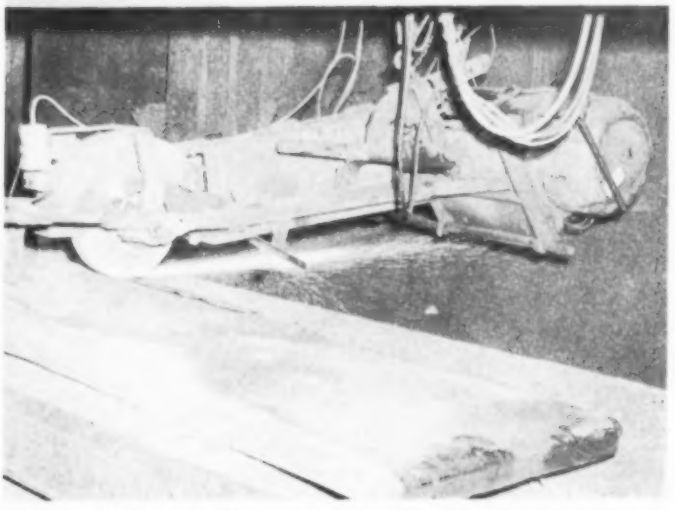
The object of the snagging operation is to remove defects, seams, scabs, and similar defects. The slabs are weighed before and after snagging to determine the weight of metal removal. Ester line indicators are used to determine the contact hours of operation. Wheel testing is set up on the removal of stock per contact hour. The type of stainless steel being processed at the South Works is 302 or 304 nickel, or straight chrome 430. All cost standards are based on 1000 lbs. of metal removed. • • •

snagging Rate

Stainless steel slabs which will be or have been ground to remove defects, seams, and scabs prior to rolling.



This is one of the 15 hp Fox swing frame grinders without the moment arm arrangement. Note only one pulley supports the grinder.



This is the 30 hp Fox swing frame grinder with the moment arm developed by U.S. Steel. Note the two pulleys, one of which is relocated to change pressure.

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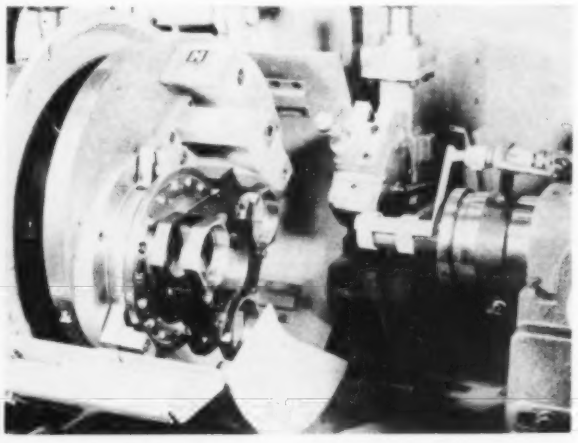
Two-Machine Team Boosts Production

● Teamwork between a precision boring machine and an internal grinder lets the Lycoming Division of Avco Corporation, Stratford, Connecticut, bore, face, chamfer and finish grind six bearing diameters in steel carrier assemblies at a rate of 7 parts per hour with 80 per cent efficiency.

Starting on the Heald Model 221 Bore-Matic, each bearing diameter is bored, counterbored, bottom faced and chamfered to a 0.0002-inch tolerance for size. Stock removal is 0.061-inch on diameter and 0.030-inch on face; finish is 63-125 microinches rms.

Work is held in a hand-operated rotary indexing fixture, located by a center hole diameter and positioned radially by a pivoted plug which fits into one of the holes to be bored. Tooling is carried on a rotating cross-feed unit.



Internal grinder set up for finish grinding of bearing carrier.

Finish Grind

Work is then moved to the Heald Model 2712 Internal Grinder where the bearing diameters, bottom faces and adjacent radii are finished ground to a tolerance of 0.0007-inch for size. The carrier is bolted to an adapter plate clamped in a 3-position manually indexed fixture with diaphragm type location and removable hand locator.

The two-in-line bores separated only by flanges of small diameter are ground by means of a double wheel in a conventional ball-track Size-Matic cycle. Opposite holes in both flanges are equally spaced within .0005-inch of true position and holes are round within .00025 T.I.R. Finish is 32 microinches rms.

Table goes into a positive stop, and both flanges are plunge ground to semi-finish size as the workhead cross slide feeds forward. The workhead cross slide retracts, table runs out to dress both wheels and the cycle repeats to grind to finish size. Work is indexed 120 degrees and operation repeated for other four holes. • • •

Better Storage of Coated Abrasives

● Tests and research into useful lengths of sandpaper life indicate that users can gain from 5% to 75% additional life from their coated-abrasives depending upon the conditions in which they are stored. Based on figures reporting over $100,000,000 annually expended on coated-abrasive products by American industry, increases in useful life resulting from proper storage conditions represent substantial savings, according to Richard P. Villwock, research engineer from Michigan Abrasive Co., Detroit, Mich.

Manufactured from abrasive grains bonded with either synthetic or natural glue adhesives to a paper or cloth backing, sandpaper performance is greatly affected by its storage environment. Extreme dryness makes the adhesive bond brittle, leading to grain shedding. Extreme dampness causes the bond to soften, thereby reducing cutting action or life.

Heat and humidity are the principal factors to be controlled in the sandpaper storage environment to gain optimum life. Stored in areas where there is a constant variation of temperature and humidity, coated-abrasives are subject to a continuous cycle of structural stresses that weakens the bond. Waterproof backings are not a guarantee against damage from humidity variation. They only prevent the backing from absorbing moisture and not from contracting and expanding with variations in the humidity levels.

As an aid to users in checking over their procedures for controlling climatic conditions where sandpaper is stored and the packaged product handled, Villwock has formulated six general rules that can be employed for obtaining maximum performance from coated-abrasives. Each rule is considered equally important and the manner in which they are listed should not place a descending order of value on its observance.

1. Keep temperature around 70°F. with relative humidity at 35% to 50%.
2. Keep cartons off the floor to prevent pickup from damp floors.
3. Store opened boxes flat on shelves and not on end, to keep from damaging edges.
4. Open cartons only when needed.
5. Rotate stock and where possible, keep using up the older shipment first.
6. Hang used belts on level hangers to prevent edge damage and keep pegs or hangers as wide as practical to prevent damaging the backing or bond.

By carefully following these simple rules, it is possible to obtain maximum life and work from all types of sandpaper. In almost every case, proper storage of sandpaper will reduce over-all sanding costs. • • •

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Standard Time Data For Grinding Part III

This third part of the Standard Time Data series covers the application of the data to cylindrical grinding. Part I of this series presented in December 1959 described the data development and application of the data to tool grinding. Part II covered application to vertical spindle surface grinding. Future parts will cover application of the data to snagging, surface and centerless grinding.

By E. A. CYROL and R. L. BORCK
E. A. Cyrol & Co., Chicago, Ill.
Management Consultants

● Among grinding operations which estimators complain most about are center-type cylindrical work. In our studies, though, they've proved to be entirely suitable for standard data development. The data presented in this and succeeding parts of the article were obtained in an extensive study in one plant which does grinding of all types.

The machine types available for our between-centers study were as follows:

1. Norton C-6x18 Plain
2. Norton C-14x48 Multi-purpose
3. Norton CTU 6x18 Plain hydraulic
4. Norton C-6x24 Plain hydraulic
5. Norton C-6x18 Plain hydraulic
6. Cincinnati No. 3—6x18
7. Landis 4H 4x18 Plain
8. Brown & Sharpe No. 1—10x20 Universal
9. Brown & Sharpe No. 2—14x30 Universal
10. Brown & Sharpe No. 5—3x18 Plain
11. Brown & Sharpe No. 20—10x18 Plain

We have divided the elements involved in the study into four groups:

1. Piece handling elements for automatic and hand operated grinders.
2. Machine handling elements for automatic grinders.
3. Machine handling elements for hand operated grinders.
4. Additional elements which may occur in either type.

Piece Handling Elements—Automatic and Hand Operated Grinders

The elements listed below and their descriptions cover in detail the work done by the operator to perform each element. The values shown represent the amount of time allowed for the average operator working at a normal pace to execute the element properly.

1. Position and Remove Dog. .080 Min.
   This element includes time allowed for the operator to position dog on piece, and tighten with dog wrench, and loosen dog with dog wrench and remove dog.
2. Pick Up and Aside Piece to Skid. .046 Min.
   This element includes time allowed for operator to pick up piece from skid to table before grind and remove piece from table to skid after grind.
3. Grease Centers. .045 Min.
   This element includes time for operator to apply lubricant to centers of work piece. Use only when observed on floor as necessary.
4. Gage Piece. Refer to Gauging Chart

NOTE: The above elements generally occur in every cycle. When grinding on hand operated machine the total time is used only when the total piece handling time is greater than lap out time. When grinding on automatic type grinder use total piece handling time when it exceeds the grind and lap time.

Machine Handling Elements—Automatic Type Grinder

The elements listed below and their descriptions cover in detail the work done by the operator to perform each element. The values shown represent the amount of time allowed for an average operator working at a normal pace to execute the element properly.

1. Pick Up and Aside Piece.
   Table to Machine. Figure 10, Chart 5
   This element includes time allowed to pick up piece from table and move to the machine centers, approximately 18" distance, and move piece from centers and place on table.
2. Place and Remove Piece on Centers. .077 Min.
   This element includes time allowed for the operator to depress tail stock lever, seat piece between centers, release tail stock lever, depress tail stock lever, remove piece from centers and release tail stock lever.
3. Advance Wheel to Grind .036 Min.
   This element includes time allowed for operator to actuate the feed lever and for the wheel to advance to grinding position.
4. Retract Wheel from Grind. .030 Min.
   This element includes time allowed for operator to actuate the feed lever and for the wheel to retract to clear position.

NOTE: Elements of start and stop workhead and start and stop coolant are not used on automatic type grinder. When operator actuates the feed lever, it automatically starts and stops workhead and coolant.

Machine Handling Elements—Plunge Grind Hand Operated Machine

The elements listed below and their descriptions cover in detail the work done by the operator to perform each element. The values shown represent the amount of time allowed for an average operator working at a normal pace to execute the element properly.

1. Pick Up and Aside Piece. Figure 10, Chart 5
   As Above.
2. Place and Remove Piece on Centers. .077 Min.
   As Above.

3. Start and Stop Workhead. .040 Min.
This element includes time for operator to move workhead lever up to start and move down to stop.
4. Start and Stop Coolant. .043 Min.
As Above.
5. Advance Wheel to Grind. .036 Min.
This element includes time allowed for operator to position grinding wheel to work until it sparks.
6. Retract Wheel from Grind. .030 Min.
This element includes time allowed for operator to retract grinding wheel from work to a clear position.

NOTE: The above elements in every cycle on hand operated machine.

Additional Elements—
Automatic & Hand Operated Elements

The elements listed below and their descriptions cover in detail the work done by the operator to perform each element. The values shown represent the amount of time allowed for an average operator working at a normal pace to execute the element properly.

1. Position Wheel to Shoulder .045 Min.
This element includes the time allowed for the operator to position the grinding wheel longitudinally to touch shoulder before removing stock.
2. Position Table. .075 Min.
This element includes the time allowed for the operator to position the table longitudinally to facilitate loading and unloading. Use when piece has a large face or difficult to position and remove from machine, for safety operation.
3. Stone Corner. .086 Min.
This element includes the time allowed for the operator to pick up a stone from the machine table, stone edge of piece while revolving in machine and to aside stone to table.
4. Grease Centers. .045 Min.
This element includes the time allowed for the operator to apply grease to both center holes in piece. This element is allowed only if observed on floor as necessary.
5. Secure Piece in Steadyrest. .100 Min.
This element includes time allowed for the operator to position and secure piece in steadyrest.

Gaging

The gaging time values as listed are based on the time allowed to check one dimension with gage listed.

Editor's Note: Gaging allowance included in standard for those who feel "incentives" increase scrap. Supervision has a control when such a "tool" is used.

SHEFFIELD GAGE:

1. Under .0005 tol. solid piece — Up to 2" Lgth. .078 Min.
Gage every pc. one position = .070 Min.
Gage every 10th pc. (2) additional positions = .008 Min.
2 x .04 = .080 ÷ 10 = .008 .078 Min. Total
2. Under .0005 tol. solid piece — Over 2" Lgth. .086 Min.
Gage every pc. one position = .070 Min.
Gage every 10th pc. (4) additional positions = .016 Min.
4 x .04 = .160 ÷ 10 = .016 .086 Min. Total
3. Under .0005 tol. thin wall piece — Up to 2" Lgth. .086 Min.

Oscillating Grind Chart # 2

Cu. In. /.001/ In. Lgt.	Diameter Over	Diameter Thru	R.P.M. of Work	Type I Table Travel Inches/Min.	Type I Min/Inch	Type I Lap Time	Type II Table Travel Inches/Min	Type II Min/Inch	Type II Lap Time
.0012		.750	310	388	.0026	.026	233	.0043	.043
.0014	.750	.875	242	303	.0033	.033	182	.0055	.055
.0016	.875	1.000	230	288	.0035	.035	173	.0058	.058
.0018	1.000	1.125	205	256	.0039	.039	154	.0065	.065
.0020	1.125	1.375	175	219	.0046	.046	131	.0076	.076
.0022	1.375	1.500	166	208	.0048	.048	125	.0080	.080
.0024	1.500	1.750	142	178	.0056	.056	107	.0093	.093
.0028	1.750	2.000	125	156	.0064	.064	94	.0106	.106
.0031	2.000	2.250	111	139	.0072	.072	83	.0120	.120
.0039	2.250	2.500	107	134	.0075	.075	80	.0125	.125
.0043	2.500	2.750	98	123	.0081	.081	74	.0135	.135
.0051	2.750	3.250	90	113	.0088	.088	68	.0147	.147
.0055	3.250	3.500	83	104	.0096	.096	62	.0161	.161
.0053	3.500	4.000	76	98	.0102	.102	57	.0175	.175
.0069	4.000	5.000	66	66	.0120	.120	50	.0200	.200

Plunge Grind Chart # 1

Diameter Over	Diameter Thru	Time Per .001 Stock	Out Time	Wheel Dress Allow.
	.250	.012	.035	.034
.250	.550	.015	.065	.068
.550	.850	.020	.095	.029
.850	1.150	.024	.110	.085
1.150	1.450	.028	.122	.097
1.450	1.700	.031	.134	.106
1.700	2.000	.035	.146	.121
2.000	2.300	.040	.158	.131
2.300	2.600	.044	.170	.141
2.600	2.900	.048	.182	.147
2.900	3.200	.052	.194	.200
3.200	3.500	.056	.206	.212
3.500	3.800	.060	.218	.227
3.800	4.100	.064	.230	.242
4.100	4.400	.068	.242	.261
4.400	4.700	.072	.254	.283
4.700	5.000	.076	.266	.309
5.000	5.300	.080	.278	.340
5.300	5.600	.084	.290	.378
5.600	6.000	.088	.302	.425

Recommended Feed Per Oscillation Chart # 3

	Feed Per Oscillation		
Diameter	0 - .875	.876 - 2.000	2.001 - 5.000
Type I	.0009	.001	.0012
Type II	.0005	.0008	.001

Wheel Dress Allowance for Oscillating Grind Chart # 4

Cu. In. Stock Removed Over	Cu. In. Stock Removed Thru	Pieces Per Dress	Allowance Per Piece	Cu. In. Stock Removed Over	Cu. In. Stock Removed Thru	Pieces Per Dress	Allowance Per Piece
	.025	50	.068	.250	.275	14	.243
.025	.050	43	.079	.275	.300	13	.262
.050	.075	37	.091	.300	.350	12	.283
.075	.100	32	.106	.350	.375	11	.309
.100	.125	27	.126	.375	.425	10	.340
.125	.150	24	.142	.425	.475	9	.378
.150	.175	21	.162	.475	.550	8	.425
.175	.200	19	.179	.550	.700	7	.486
.200	.225	17	.200	.700	.900	6	.567
.225	.250	16	.213	.900	1.000	5	.680

Chart # 5
Pick Up Piece Table to Skid

Weight	Pick Up	Aside
0 - 1#	.033	.034
1.1# - 5#	.040	.034
5.1# - 10#	.045	.034

Surface Gage Before .120 .04 each additional position	
After .100 .04 each additional position	
Flush Pin Ga. Before & After	.140

Gaging Time Chart #6
Sheffield Gage

Length	Under .0005 Tolerance
0 to 2"	.078
2" & Over	.086
Thin Wall	
0 to 2"	.086
2" & Over	.115
.0005 to .001	
0 to 2"	.019
2"& Over	.030
.001 & Over	
All	.008

Shoulder Grinding Time Chart # 7

Width of Shoulder							
0 - .250	.251 - .375	.376 - .500	.501 - .625	.626 - .750	.751 - .875	.876 - 1.000	
.014	.030	.034	.040	.044	.048	.052	
Time Per .001 Stock Removed							

Wheel Touch Up Allowance for Shoulder Grind Chart # 8

Diameter	.250	.550	.850	1.150	1.450	1.700	2.000	2.300	2.600	2.900
Allowance	.036	.072	.085	.090	.102	.112	.128	.138	.150	.157
Diameter	3.200	3.500	3.800	4.100	4.400	4.700	5.000	5.300	5.600	6.000
Allowance	.211	.225	.240	.257	.277	.300	.327	.360	.400	.450

Figure 10, charts of data for cylindrical grinding operations.

Gage every pc. one position	=	.070 Min.
Gage every 5th pc. (2) additional positions	=	.016 Min.
2 x .04 = .080 ÷ 5 = .016		.086 Min. Total
4. Under .0005 tol. thin wall piece	Over 2" Lgth.	118 Min.
Gage every piece one position	=	.070 Min.
Gage every 5th pc. (6) additional positions	=	.048 Min.
6 x .04 = .240 ÷ 5 = .048		.118 Min. Total
5. .0005 thru .001 tol.	Up to 2" Lgth.	.019 Min.
Gage every 5th piece one position .07 ÷ 5 = .014	=	.014 Min.
Gage every 15th pc. (2) additional positions	=	.0053 Min.
2 x .04 = .08 ÷ 15 = .0053		.0193 Min. Total
6. .0005 thru .001 tol.	Over 2" Lgth.	.030 Min.
Gage every 5th piece one position .07 ÷ 5 = .014	=	.014 Min.
Gage every 10th pc. (4) additional positions	=	.016 Min.
4 x .04 = .16 ÷ 10 = .016		.030 Min. Total
7. Over .001 Tol.		.007 Min.
Gage every 10th pc. one position .07 ÷ 10 = .007		
Micrometer O.D. & Depth:		.210 Min.
Surface Gage:		.120 Min.
Check piece before grind (Use only when no arbor is used)		
Check piece after grind		.100 Min.
Flush Pin Gage:	Before	.070 Min.
	After	.070 Min.
Snap Gage (Go-No-Go)		.080 Min.

Personal and Unavoidable Delay

These allowances cover the following types of external grinders (center type):

Norton 6 x 18
Landis 4 H Plain
Brown & Sharpe No. 20
Brown & Sharpe No. 5
Brown & Sharpe No. 2
Cincinnati No. 3

This data was gathered from 8 hour studies.

Unavoidable Delays: Allowed 15.00 Minutes

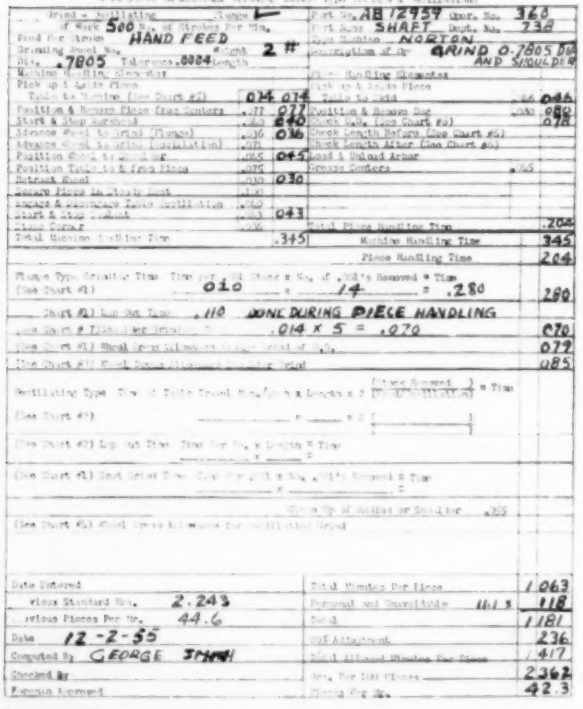

Figure 11

These delays occur throughout the day and consist of:

1. Receiving instruction from setup man, foreman or inspector.
2. Trips to inspection bench or tool crib.
3. Interference from or assistance to truckers or material handlers.
4. Adding coolant to machine.
5. Clean machine and work area.
6. Fill out time card, and job card.
7. Get tools out, and put away.

Wheel Care Allowance:

The wheel care allowance is carried over to the work sheet and given a time allowance per piece.

Personal Time:	Allowed 33.00 Minutes
Unavoidable Delays Allowance	15.00 Minutes
Total Personal and Unavoidable Delay Allowance	48.00 Minutes

Calculation of % allowance:

$$\frac{48.00}{480.0 - 48.00} = 11.1\% \text{ Allowance}$$

As we've said before, the Standard Data Work Sheet is an important key to the success of any standard data program. It is the tool with which the job estimator calculates the total time for the operation and sets the production standard. To be useful to the estimator, the work sheet must be designed for convenience and ease of calculation.

To explain the use of the work sheet on this and the following pages, we've worked out a sample time for an operation. Calculation is done on the front of the sheet, using data found in charts on the back of the sheet.

When additional elements not found on the Work Sheet are found to be necessary, a time study should be taken to obtain this information. This additional element should be recorded in the writeup for future reference and development of standard data for the operation.

Steps in Completing the Work Sheet

1. Fill in upper right hand corner of Work Sheet (Figure 11) with part number, operation number, department number, type machine, and description of operation.
2. Fill in upper left hand corner of Work Sheet with type of grind (plunge or oscillation), R.P.M. of work (Figure 12). On a plunge grind standard you do not need No. of Table Strokes Per Min., or Feed Per Stroke. Obtain the weight of piece, and if using an arbor also add weight of arbor to piece. Fill in diameter, and tolerance.
3. Fill in elements pertaining to "Machine Handling Time."
   a. To find value for "Pick Up and Aside Piece," see reverse side of work sheet and refer to Chart No. 5 (all chart numbers refer to Figure 10 which shows the back of work sheet) select value to correspond with weight, and enter in total column.
   b. Enter value of "Position and Remove Piece from Centers" in total column.
   c. Enter value of "Start and Stop Workhead" in column when piece is run on hand operated machine, on automatic machines the

workhead starts and stops during the advance and retract of the wheel.

d. Enter value for "Advance Wheel to Grind."

e. Enter value for "Retract Wheel."

f. Enter value for "Position Wheel to Shoulder" only when grinding a shoulder or when the width of an undercut is .125" wide or less.

g. Enter value for "Position Table to and from Piece" when table must be cleared to remove piece and to position piece in centers.

h. Enter value for "Secure Piece in Steady Rest" when routing calls for a steady rest.

i. Enter value for "Stone Corner" when routing calls for Stone Corner.

j. Enter value for "Start and Stop Coolant" when using hand operated machine, on automatic machines the coolant starts and stops with the advance and retract of the wheel. Total all elements in column and enter the total time in column at right titled "Machine Handling Time."

4. Fill in elements pertaining to "Piece Handling Time."

a. Enter value for "Pick up and Aside piece from Table to Skid" in total column.

b. Enter value for "Position & Remove Dog," only when using dogs, not while using an arbor; arbors have stationary dog at driving end.

c. From Chart No. 6 select the proper "Check O.D." value determined by length of grind and tolerances being held. Enter the value in the total column.

d. When blueprint calls for a specific length to be held and centers are used, refer to Chart No. 6 and select value for "Surface Gage Before Grinding." When face of shoulder is greater than ½" allow two additional positions. Total the values and enter in the total column. Values do not apply when an arbor is used.

e. Paragraph "d" applies to "Surface Gage After Grinding," and is allowed when either arbors or centers are used.

f. When an arbor is to be used and "Piece Handling Time" will be external, a time study check must be made for this element to derive the time allowance. Plot this time on Spread Sheet for future data.

g. When "Greasing of Centers" is required, allow the value shown for an established frequency, i.e., 1/1, 1/2, 1/3, etc.

Total all elements in column and enter the total time in column at right titled "Piece Handling Time."

NOTE: When this total time is exceeded by the "Lap Out Time," it is to be circled out. Elements will be performed internal to the "Lap Out Time."

Calculation of Grinding Times

5. Plunge Grind:

a. Upon determining diameter to be ground, refer to Chart No. 1 and circle the time values shown in the columns opposite the diameter ground. Enter the "Time Per .001 Stock Removal" in space provided. Determine the total number of .001's stock removal from blueprint, plus the T.I.R. allowed on previous operation and enter in the space provided as a whole number, e.g., (.013" stock removal = 13). Multiply and enter in the total column.

b. From Chart No. 1 select the proper "Lap Out Time" and enter in the total column only if this time exceeds the "Piece Handling Time".

c. From Chart No. 7, select the proper "Shoulder Grind Time," determined by the width of shoulder, and enter in the space provided. Determine the total number of .001's stock removal from the face of shoulder from the blueprint, plus the T.I.R. allowed on previous operation and enter in the space provided as a whole number, e.g., (.005" stock removal = 5). Multiply out the same as grind time and enter in the total column.

d. From Chart No. 1 select the proper "Wheel Dress Allowance" for the plunge grind of the O.D. and enter in the total column.

NOTE: When holding a micro finish of 15 or less and/or grinding an interrupted surface with a tolerance of .0005" or less, double the allowed time.

e. From Chart No. 8 select the proper "Wheel Dress Allowance for Shoulder Grind," determined by the diameter being ground and enter in the total column.

NOTE: Allowance is to be used when an undercut is shown between O.D. and shoulder or when a radius of .020" or more is ground. When holding a radius less than .020", double the allowed time.

6. Add right hand column and enter total on "Total Minutes Per Piece" line.

7. Add allowances and Calculate standard.

• • •

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Diameter of Work	RPM
.250	1527
.500	764
.750	509
.875	436
1.000	382
1.125	339
1.250	305
1.375	278
1.500	255
1.750	218
2.000	191
2.250	170
2.500	153
2.750	139
3.000	127
3.250	117
3.500	109
3.750	102
4.000	95
5.000	76

Figure 12—RPM SELECTION FOR WORKHEAD. Required workhead RPM to obtain 100 Surface Feet Per Minute under normal conditions. Of course, SFM must be varied from about 65 to 150 according to grinding conditions encountered.

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241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
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41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
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241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
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EDITORIAL

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31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

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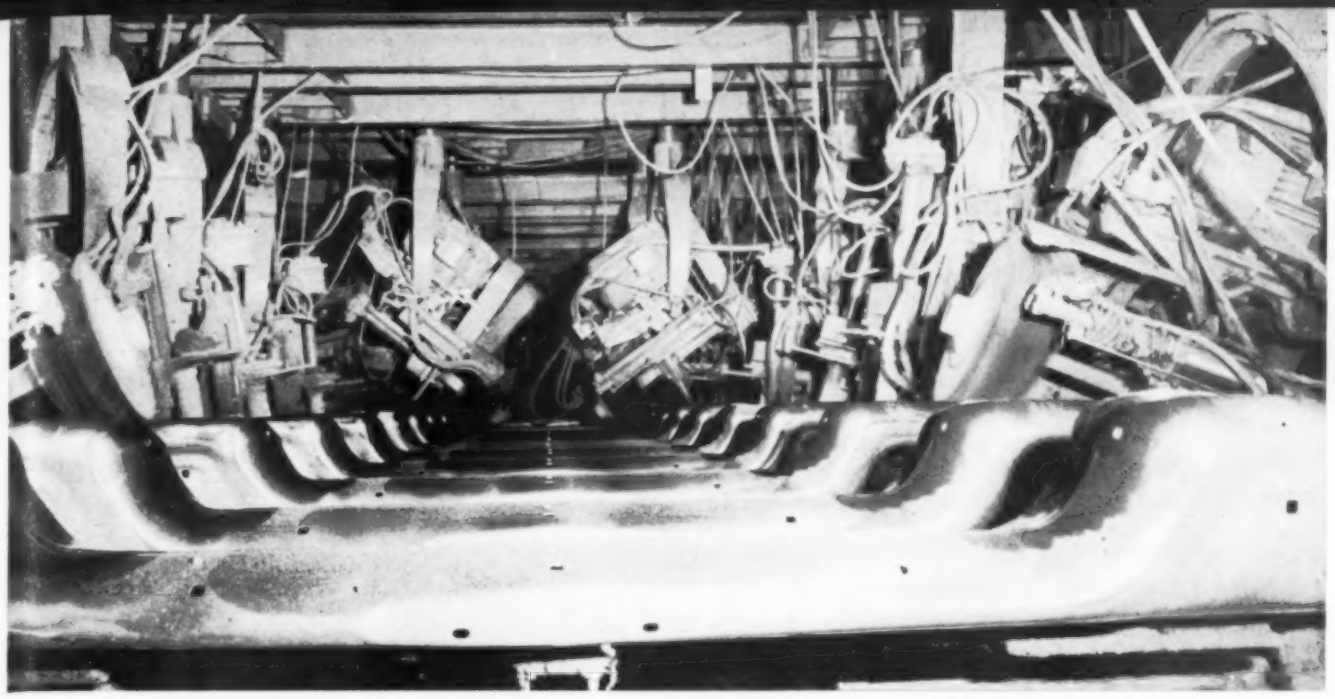


These whirling buffing wheels automatically polish steel bumpers moving along a conveyor line. The polishing prepares the surface for plating. (Photo—Ford Motor Company)

How's Your Buffing Average?

Getting the most production out of your buffing equipment is mostly a matter of knowing the characteristics of the various buffs and compounds, partly a matter of experimenting to find the best combinations.

By STANLEY SAX
Executive Vice President
American Buff Company

● While much has been learned in recent years about the results that can be expected from various kinds of buffs and compounds, there is still a great deal that must be worked out by each individual plant. Buffing is still an art. While it is possible to secure considerable information about any given application, the final determinations must be made in a particular plant on its equipment, and sometimes even with a particular operator or group of operators.

Buffing is often confused with polishing. Indeed, the two terms are frequently interchangeable. For this purpose, buffing is regarded as a finer operation than polishing, with less stock removal and a shallower scratch pattern. Coloring is still finer than buffing, with the generation of finish as the prime objective and without any stock removal to speak of.

Polishing is done with coated abrasive belts or discs, with set-up wheels of felt or hide, or with buff sections sewed and glued together. Buffing and coloring are usually done with buffs.

Length of Exposure

One of the first considerations which the parts finisher should bear in mind in his finishing operation is the length of time a part should be exposed to the buff surface in order to obtain a desired finish. The length of time required for different metals and different finishes may be measured in hundredths of a minute per linear inch. Broadly speaking, a high surface speed of the buff will result in shortening the time required for the buffing operation. Higher shaft rpms and large wheel diameters will step up production, if the remainder of the finishing operation is conducted efficiently.

Achieving an optimum surface speed for every metal and metal condition to attain a specific finish will depend, of course, on contour of the work, the fixtures, operator and conveyor speeds. Some hand operated buffing machines have the facility for

Six common types of sewing on solid cloth buffs. Spiral, radial arc, and radial arc with spiral center.

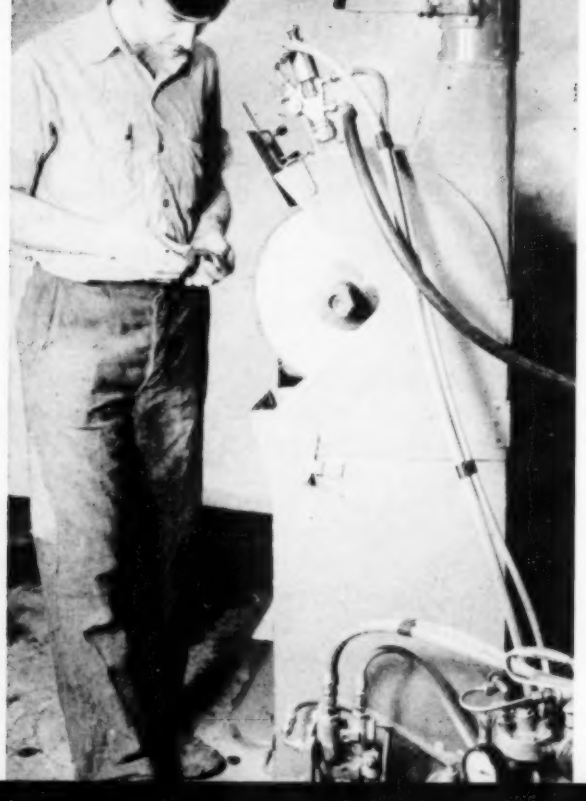
varying rpm rates, but the fully automatic machines seldom are equipped to vary rpm with a simple adjustment during buff wear-down.

Surface Speed

Determining an ideal surface speed is based on two factors: the diameter of the buff and the rpm of the shaft. Obviously, as a buff wears down, the surface speed at the point of contact with the part will decrease. Because of the difficulty of adjusting speed of rotation during this wear-down process, it is wise for the finisher to determine his average working speed on an average usable buff diameter.

Making trial runs with new machinery to adapt it to a specific job is advisable. It is also important to make sure that the machine is sufficiently powerful to maintain surface speed of the buff when heavy pressure against a part is required. Because buffing departments are required to finish various parts, these different parts may require varying pressures of the buff to be exerted. And, of course, different types of buffs will work best on different parts.

Foot-operated spray system for applying liquid compounds to buffs.



Solid Cloth Buffs

Among the solid cloth buffs, full disc loose buffs and unsewed discs are used for the coloring operation, that is, putting a high polish on a part. Generally speaking, sewed buffs are used for cutting. For buffing out deeper scratches and other imperfections and to obtain more cut for harder metals, the closer sewings are used. There are, of course, many types of sewings which are used for different purposes, such as spiral for general work, square sewing for uniformity, and radial, also called sun-ray sewing, which forms pockets to hold compound. Various other types of sewings are used in special applications.

For the buffing of plastics, soft metals and sterling silver, wool buffs work out very well. Russet sheep skin and white alum sheep skin are used for metals containing lead. These prevent surface drag or smearing—russet for cut, alum for color.

There are various types of folded, or "pocket" buffs which are excellent for holding compound and allow a degree of flexibility. Flexibility enables these buffs to be used on parts where contour is a factor.

The use of polishing wheels, made of conventional buff sections glued or cemented together, is often the lowest cost method of polishing. Polishing wheels are usually made up of spiral or square sewed buff sections. In order to avoid the straight lines caused by ordinary buff sections which can streak the work, pie-shaped segments are sometimes alternately inserted. These result in a streak-proof, non-ridge wheel.

A puckered style, sometimes known as a bias buff, is frequently used in the production of bright metal parts where automatic machinery, rapid rpm, pressures and increased dwell time cause more heat build-up in the buff wheels. The ruffled characteristics of this buff make it cooler running than some of the older types. Where heat is a great factor, ventilated centers are often used.

It is a good idea in many cases to use a buff that has a large outside diameter and high density. This will result in fewer change-overs, less down-time and less labor. The only increase in expense is due to actual increased material content. When properly applied, this greater material content results in greater buff life.

The centerless buff, a wheel made up of a number of buff sections which interlock each other and may be added or removed at will, has certain definite values in superior balance and

Square, radial, and concentric sewing.

contour retention. A special centerless buff can be used as a polishing wheel, the main advantage of this being the ease of adding or removing buff sections. This enables the operator to widen, narrow or change the contour of the wheel. Because these centerless polishing wheels require no glue, a more uniform density is obtained. It results in a soft polishing wheel and gives efficient part coverage.

Sisal Buffs

Since World War II, sisal buffs have come into wide-spread use. They have certain advantages over cloth buffs, due to their toughness, great structural strength and resistance to deterioration by buffing compounds. They are excellent when applied in the bare metal process, the buffing of steel followed by copper, nickel and chrome plating.

Various puckered and open designs are available in sisal buffs. When used on contoured steel and stainless steel parts, these designs give truly flexible sisal buffs. Numbered among these designs are the unit sisal, the open cloth puckered sisal and the open double cloth puckered sisal. These add to the advantages of sisal the strength and compound-retaining characteristics of 86/93 muslin.

Compounds and Their Application

Generally speaking, buffing compounds may be applied in two basic ways. There is the solid, bar-type of compound which is held against the buffing wheel to form a buffing "head." The other method involves the use of compound in liquid form which is sprayed on the junction between the buffing wheel and the work.

The binders used in all compounds are primarily greases, fats, and waxes. Those in most general use are stearic acid, hydrogenated fatty acids, tallow, hydrogenated glycerides, and petrolatum. Companies engaged in producing compositions for buffing recommend specific products for certain types of jobs. Greasier grades are generally used on larger parts and those where the surface may be somewhat rough. A faster cutting action is obtained and the greasier varieties also tend to reduce burning and to increase the life of the buffing wheel.

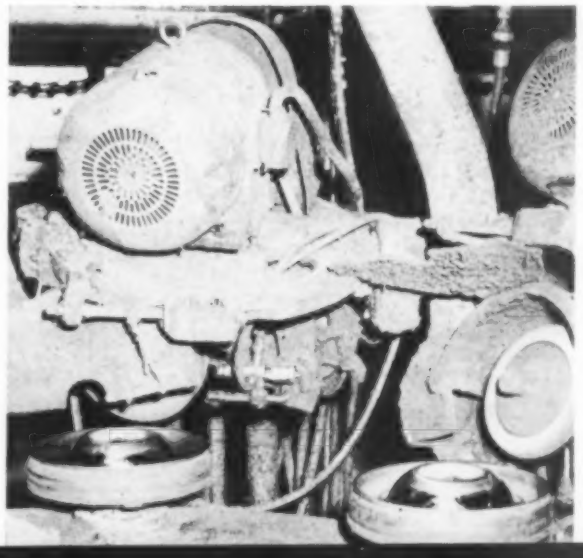
For such softer metals as die cast metal, aluminum, brass, copper, as well as some of the plastics, Tripoli compositions are used. This name is derived from a type of earth of gray, red or yellow color which was originally found in Tripoli, North Africa. The American variety, commonly in use today, comes from Seneca, Missouri. For the buffing of nickel, lime compositions have proved to be best.

Compositions carrying the designation, "steel" or "standard steel" are recommended for the buffing and coloring of ferrous metals. Greaseless compositions do the best job of producing a butler or satin finish. These compositions use glue as a bond instead of grease.

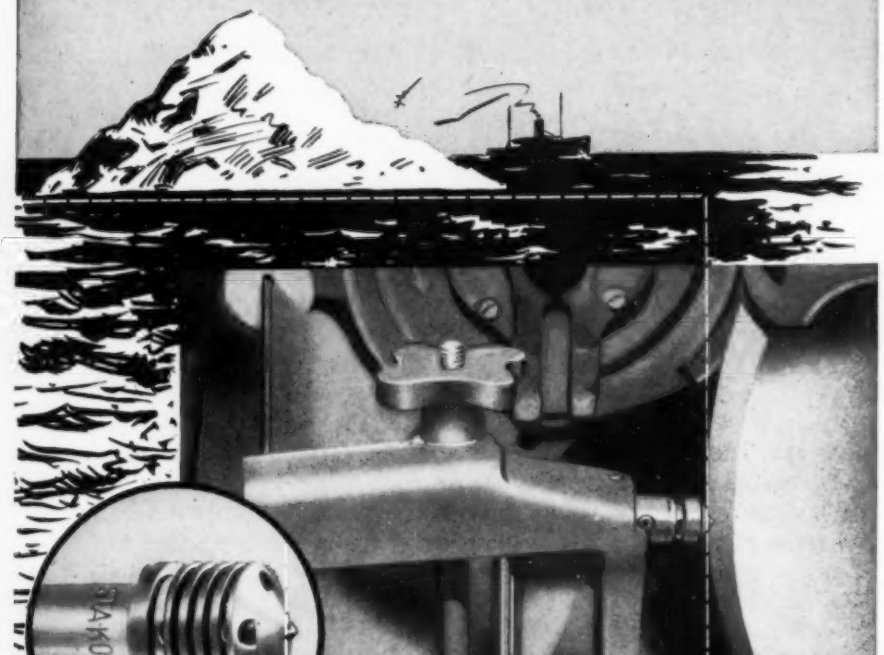
Liquid compositions often save in compound used. There are no left-over nubbins which require re-melting. Another factor in the favor of liquid compounds is the lack of additional buff wear-down caused by applying the compound to the buff surface. Liquid compounds in which the abrasives are suspended in water cut down the possibility of fires. Lastly, compound application by the spray method results in greater uniformity. A problem which has arisen, however, with liquid compositions is that some do not retain the abrasive in proper suspension and therefore, require frequent agitation.

Metal finishers should look to the buff manufacturer for the answers to specific problems which arise in their buffing departments. The application of the proper buff for a particular job at hand; arriving at an optimum buffing speed for individual parts; proper choice and use of compounds; and determining the right pressure between the wheel and the work piece will effect economies and achieve greater efficiency in production. These four considerations can help you better your "buffing average." • • •

Buffing of automobile hub caps prior to plating. Sisal buffs are recommended for use in the bare metal process for buffing of steel prior to chrome, nickel or copper plating.



THERE'S MORE HERE THAN MEETS THE EYE...



In an iceberg or in a J. K. Smit Diamond Tool only a fraction shows above the surface.

Everyone knows about the unseen portion of an arctic iceberg. Many do not realize the unseen factors that lie beneath the surface of a J. K. Smit Diamond Tool, such as . . . our constant research to find still better methods of manufacturing Diamond Tools, the unquestioned integrity of our company since 1888, the manufacturing skills that have been learned and passed on through all those years, and quality control of manufacture for tool duplication.

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Belts Grind Sheet Beryllium

Claimed to be first successful production grinding.

● Sheet beryllium has been ground and polished to a finish equivalent to No. 4 stainless by product engineers of Behr-Manning Co., using a sequence of abrasive belts. This is believed to be the first successful production grinding of the sheet form of this rare light metal, in which the Air Corps is displaying keen interest.

Extracted, cast and rolled by the Brush Beryllium Co., of Elmore, Ohio, the hard and extremely brittle metal presents a rough, deeply pitted surface to the grinding belts. Experimentation was carried out on a pinch-roll abrasive belt grinder, using a 26" x 126" belt and working always with a flood of water at the grinding point to wash away toxic dust into the filter system. Engineers wore respirators and gloves. Air pollution checks were made periodically.

To remove pits and inclusions, it was necessary to grind 0.008" to 0.010" from the surface. Best results were obtained with a grit sequence of 60, 100 and 150, using X-weight cloth to which the silicon carbide was waterproof bonded with an all-resin adhesive.

Both rough grinding and polishing were done with a belt speed of 2100 sfpm and a work feed of but 2 fpm. Multiple passes were required prior to polishing. Both sides of the sheet were polished.

Because sheets were not only extremely brittle but bowed as well, it was necessary to use only the lightest pressures while grinding. The pinch rolls which serve as work holders were operated with no spring pressure whatever. Soft rubber contact rolls and pinch rolls helped to provide the required conformity with the work.

The toxic hazard of the metal necessitates periodic air pollution checks by competent health physicists during the grinding. Afterwards, it is recommended that all used belts, grinding sludge and other contaminated objects be placed in a sealed steel drum and buried.

• • •

Literature

1. Mounted Wheels. A new standard-sized folder, "Cincinnati Mounted Wheels" (PG-358), describes the features of these wheels and contains a complete chart showing all standard shapes and sizes of mounted wheels. This chart can be detached and hung on the wall for ready reference. The booklet also contains a table showing recommended starting grades for various jobs, and lists several rules of thumb to follow in selecting mounted point wheel grades. Cincinnati Milling Products Division, Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

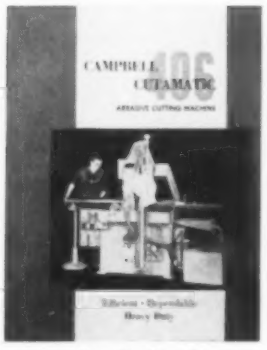
2. Grinding Wheel Dressers. A four-page, two-color folder, punched for standard three-ring binder, describes and illustrates various types of grinding wheel dressers. Huntington style dressers, precision mechanical dressers with either carbide or high carbon alloy steel cutter units, and diamond dressers are included. Prices for all dressers and replacement units are quoted. Machine Products Corporation, Dayton, Ohio.

3. Wet Abrasive Cutter. An information-packed four-page folder, Bulletin DH-260-R, describing the Campbell 406 wet abrasive Cutamatic has just been released. Designed to give long, trouble-free service under severe working conditions, the unit is an oscillating-wheel type of wet abrasive cutting machine with hydraulically operated work clamps and wheel feed. Hardened steel, high temperature-resistant alloys, corrosion-resistant steels and many of the new metals up to 6" round or square can be cut at the rate of 4-8 seconds per square inch. Standard specifications have been tabulated for quick reference. Also included is a detailed description of the unit. Allison-Campbell Division, American Chain & Cable Company, Inc., Bridgeport 2, Conn.

4. Vibratory Type Finishing Equipment. A two-page flier, Form C-35-S, includes specifications for a new Almco Model VT 72 Vibrasheen along with descriptive material about the machine. With a capacity of 2½ cubic feet, the unit is said to require only about half the floor space of comparable equipment. Almco, Queen Products Division, King-Seeley Corporation, Albert Lea, Minnesota.

5. Deburring and Burnishing Wheel. A new type of abrasive wheel composed of a net-like mass of metal fiber, resin-impregnated and heat-cured, is described

(See Number 1)



(See Number 3)

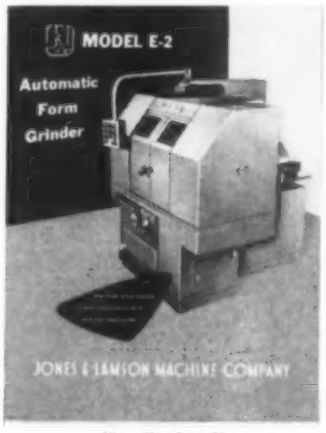
(See Number 6)

On ferrous metals and alloys, the wheel is said to be superior for the removal of burrs without danger of gouging or stock removal. On non-ferrous metals, superior polishing is claimed. Ability to cut and shape lucite, plexiglas, and similar products is also claimed. Antro Abrasives, Inc., New York, N.Y.

6. Air Gages. A new 16-page catalog containing complete specifications and price information on the expanded line of Dearbornaire precision air gaging instruments, elements, and related accessory equipment has recently been published. Featured are single and multiple column instruments equipped with a new "Multi-Amp" tube which permits conversion from one amplification to another simply by changing calibrated scales. Dearborn Gage Co., Air Gage Division, Garden City, Mich.

7. Table-Rooms for Blasting. A new 12-page bulletin, No. 805, describes the push-button controlled LK and LM Rotoblast table-rooms designed to clean various-sized pieces ranging from small parts to castings up to ten feet wide and weighing as much as six tons. Illustrated field reports show how these installations are saving money and man-hours on cleaning jobs formerly done by hand. In addition to photographs and cut-away diagrams, the bulletin gives complete dimensions and specifications of eight table-rooms, showing how each may be tailored to particular requirements. Pangborn Corporation, Hagerstown, Maryland.

8. Automatic Form Grinder. Four-page folder describing the Model E-2 automatic form grinder, a machine said to be specifically designed for high-production, precision plunge grinding on shaft work up



(See Number 8)

to 31" in length, as well as for other types of between-centers grinding. Complete specifications are listed. Jones & Lamson Machine Company, Springfield, Vermont.

To obtain literature use Reader Service cards on page 46. Circle on the card the number which appears at the start of the paragraph describing the literature you request.

FREE LITERATURE continued

9. Condensation Pumps. A new product bulletin describing the Illinois condensation pump line has just been released by American Air Filter Co., Inc. Explaining and illustrating the six basic pumps of the line, Bulletin CP-600 includes design features, general specifications, engineering data, dimension drawings, construction and operation details, and a check list to follow in the selection of a pump. Data and drawings pertain to both single and duplex units. American Air Filter Co., Inc., Dept PD, Louisville 8, Kentucky.

10. Abrasive Cut-Off Machine. The Radiac® fully automatic abrasive cut-off machine, Type N16-FA, for wet cutting of solids up to 1" in diameter in lengths up to 6", is covered in this two-page, two-color flier. Close-ups show the air-hydraulic cylinder operating the up-and-down stroke of the cutting head and the automatic feeding mechanism. Special features of the unit are listed, and full specifications are included. A. P. de Sanno & Son, Phoenixville, Pennsylvania.

11. Nondestructive Testing. Four-page folder reports on some of the major Magnaflux test systems and shows how many of today's nondestructive testing problems can be solved. Under the title, "For Every Answer . . . there was a problem," it points out how one or another of its techniques has been applied to typical problems. Magnaflux Corporation, Chicago, Illinois.

12. Coolant Cleaning Equipment. This illustrated eight-page brochure discusses the use of Barnesdril Kleenall fabric filters, as well as combination magnetic and fabric filters. Production savings are outlined, the operation of the equipment is explained, and applications are shown. These filters are said to remove sludge from coolant automatically in grinders, gear shavers, superfinishers, and other metalworking machines. Bulletin No. 110, Barnes Drill Co., 886 Chestnut Street, Rockford, Illinois.

13. Dished Depressed Center Grinding Wheel. Four-page brochure, punched for insertion in a standard binder, describes in detail a new Duraflex dished-depressed center grinding wheel for use on high-speed portable grinders. Written for those with problems in portable problems, the folder discusses the design characteristics and safety features of the new wheel. American Emery Wheel Works, Providence 1, Rhode Island.

14. Toolroom Surface Grinder. Bulletin No. 237 describes the new Jones & Shipman Model 1400 surface grinder. Included as a standard feature of the machine is a power-operated rapid traverse mechanism to relieve the operator of fatigue when raising or lowering the wheelhead over long distances. Automatic downfeed is available as a recommended optional feature. Micromatic Hone Corporation, Detroit, Michigan.

15. Vibratory Type Finishing Machine. Four-page brochure describes and illustrates new material finishing equipment now being manufactured by Conveyor Corporation's Finishing Division. With Vibro-Finishing and Vibro-Mation, considerable reduction in manpower is claimed, along with faster work cycling, inspection of parts in process, low horsepower requirements, maximum utilization of floor space. A sketch shows the directional flow of parts and media. Conveyor Corporation, Roseville, Michigan.

(See Number 12)

16. Mounted Wheels. Principles of safe and efficient operation of mounted grinding wheels, with tables of maximum operating speeds, are thoroughly covered in this 36-page booklet prepared by the safety committee of the Grinding Wheel Institute. Standard sizes of mandrels and wheel shapes are detailed and charted. Shape and mandrel sizes for each group of standard shapes are tabulated. The principles on which maximum speeds are based are explained fully. The Grinding Wheel Institute, Cleveland, Ohio.

17. Precision Thread, Form Grinding Machines. A new twelve-page catalog, No. TFG-11-59, describes and illustrates Model Nos. 101 and 103 precision thread and form grinding machines with typical Crush-true® threading applications. Both of the Sheffield machines are designed for toolroom and production thread and form grinding. Class 3 threads 8 to 40 pitch, and precision worms can be

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Semi-Firm Binder
Brightboy GB

The addition of the Semi-Firm GB Binder to the Brightboy line introduces new, time-saving rubber-cushioned abrasive compounds of inimitable formulation and unusual versatility.

GB rounds out the Brightboy line—**the only complete, comprehensive STOCK LINE of multi-use rubber-bonded abrasives.** Wheels, sticks, rods and blocks for machine and manual operations bring a wide, revolutionary concept to finishing—work saving applications not previously associated with abrasive uses.

With the introduction of the new Semi-Firm GB Binder, the Brightboy line now consists of FOUR BASIC RUBBER-CUSHIONED BINDER GROUPS: ST, Soft, GB, Semi-Firm; BL, Firm; TT, Tough. New GB combines the advantages of the Soft ST Binder with the durability of the Firm BL. *Each* of these four basic groups is made in an extensive range of Aluminum Oxide and Silicon Carbide abrasive grains. An additional binder, Fine-Tex, is compounded with pumice abrasive. All are available from STOCK. You may have employed other methods or products in an endeavor to obtain the results which can now be achieved by new Semi-Firm Binder GB or other Brightboy Abrasives. Benefit from the new GB Binder—or the other Brightboy Binders. All JOB-MATCHED to your production in speeds and strength.

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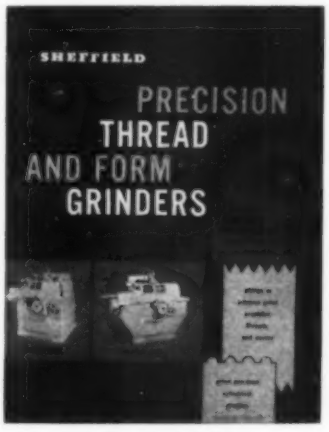
plunge-ground on the machines, according to the catalog. Work capacities common to both machines are: 7" maximum diameter of part and 3" maximum thread diameter. Model 101 accommodates maximum part length up to 12"; Model 103 up to 24". The Sheffield Corporation, Dayton, Ohio.

18. **Electronic Trouble Spotter.** Two-color, four-page folder describes the Electro Probe, an electronic trouble spotter, which is said to have wide use in grinding and burnishing operations on non-ferrous metals. It is also used for other sorts of production testing. Erwood, Inc., Chicago, Illinois.

19. **Surface Measurement.** A twelve-page pocket-sized surface measurement reference manual containing important excerpts from the American Standard ASA B46.1-1955 for Surface Roughness, Waviness and Lay is now available. This 4" x 7½" manual, profusely illustrated, covers classification of surface characteristics, stylus-type measuring instruments, precision reference specimens, roughness width cutoff, and notes on control of surface roughness. A conversion chart on the back of the manual provides for quick conversion of arithmetical average to root mean square averages in microinches. Brush Instruments, Division of Clevite Corporation, Cleveland, Ohio.

20. **Automatic Thread Grinding Machine.** Two-page flier describes a new Model F thread grinding machine, said to be designed for high production of standard taps. Advantages of the machine are listed



(See Number 17)

as long lead screw life; constant, uniform grinding cycle; automatic wheel trueing; automatic, positive size control; and automatic work and wheel speed changes. Complete specifications for the machine are listed. Jones & Lamson Machine Company, Springfield, Vermont.

21. **Centerless Grinding Wheels.** Bulletin CW59 describes the Macklin line of centerless grinding and regulating wheels. Data on applications and their results are included, along with suggestions of gradings for different materials and parts. Macklin Company, Jackson, Michigan.

22. **New Heald Condensed Catalog.** A new 16-page, two-color, illustrated and condensed general catalog, No. 1-2, describes the basic design features of all Heald machines and covers the various models of internal grinders, rotary surface grinders, tool sharpeners, Bore-Matics and attachments available. Twenty-four internal

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BEFORE BRUSHING

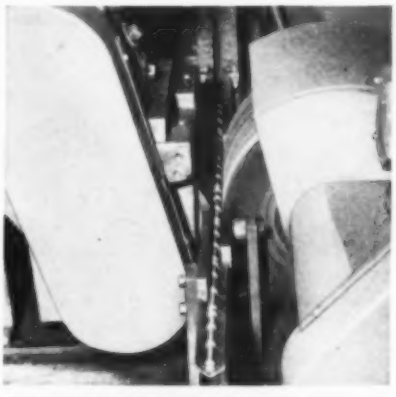
Magnified section of hardened steel hydraulic control valve. After machining, sharp edges and fine grinding burrs still remain—interfering with efficient long-life valve performance.

AFTER BRUSHING

Valve edges are precision blended . . . each radius microfinished to .002" tolerances. Burrs are thoroughly removed at the same time. Osborn Centerless Power Brushing does the job rapidly, economically . . . assures increased, troublefree hydraulic valve life.

Microfinishing valve edges to a .002" radius

. . . at rates of 1200 parts-per-hour with OSBORN Power Brushing



CENTERLESS BRUSHING SETUP precision finishes hydraulic control valves at production rates of 1200 parts-per-hour. Finish blend on valve edges can be controlled to any desired microinch tolerance. Job is done on a centerless machine—with Osborn Matic Centerless Brushes operating at 1750 rpm.

HYDRAULIC component manufacturers today—producing parts like this control valve—require ultra-high degrees of precision finishing. And Osborn Power Brushing helps meet the demands of modern high-pressure hydraulics with quality finishing, deburring and surface blending methods for hundreds of different types of parts.

In addition to the versatility and *precise quality control* afforded by Osborn Power Brushing methods—leading manufacturers also find that finishing operations are done more rapidly . . . at significantly lower cost.

An **O**sborn **B**rushing **A**nalysis—made in your plant at no cost or obligation—can pinpoint where you can speed production . . . improve quality . . . cut costs with modern Osborn Power Brushing. Write us for full details. *The Osborn Manufacturing Company, Dept. G-2, Cleveland 14, O.*

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POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY
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FREE LITERATURE *continued*

grinding machines are described. These include multi-purpose chuck types, automatic chuck types, roll type and shoe type centerless grinders, and chucker types. Heald rotaries are listed in three sizes of vertical column machines. Twelve attachments are illustrated. The Heald Machine Company, Worcester, Mass.

23. Machine Shop Accessories. A new 48-page catalog (No. 37A) lists and describes arbors, adapters and other machine shop accessories available from Brown & Sharpe. The listings include the important features and characteristics of the products shown grouped compactly so that the materials, limits and other features can be absorbed at a glance. Another feature is the illustrated index. This shows the products in small size, so that the user can quickly determine the product he is seeking and the page number on which it appears. Brown & Sharpe Mfg. Co., Providence, R.I.

24. Diamond Dressers. Full prices, specifications and information about re-setting of diamond dressers . . . a catalogue of diamond dressers for every need and use. Included also is information about the inexpensive "Letter Series" of diamond tools. Arthur A. Crafts Company, Inc., Boston, Massachusetts.

25. Economics of Blast Cleaning Structural Steel. A new bulletin, "The Facts in the Case for Cleaning Structurals," discusses the economic aspects of blast cleaning structural steel prior to its use in commercial construction. Long and short range considerations affecting construction contractors, structural fabricators and the owners of commercial structures are treated, along with the effects of blast cleaning on maintenance costs and on the life of structural steel coatings. Illustrations depict equipment and techniques used in blast cleaning angles, channels, beams, plate and other structural shapes. Bulletin 152-D. Wheelabrator Corporation, 1169 S. Byrkit St., Mishawaka, Indiana.

(See Number 23)

26. Abrasive Cutting Wheels. Bulletin DH-214 gives complete information on abrasive cutting techniques and the wide selection of Allison wheel specifications. Abrasive cutting wheels are available in diameters from 3" to 34", thicknesses from .006" to 3/16". Allison-Campbell Division, American Chain & Cable Company, Inc., Bridgeport, Connecticut.

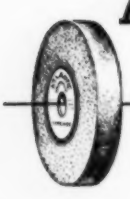
27. Diamond Wheels. Catalog ESA-290 contains complete listing of prices of diamond wheels, arranged by shapes and bonds, in both natural and man-made diamonds. Also included are a tabulation of old and current wheel type numbers, illustrations of the various wheel types, and explanation of the Simonds diamond wheel marking chart, and general recommendations for grinding cemented carbides. Simonds Abrasive Company, Philadelphia, Pennsylvania.

Wider lip design of ATLANTIC Resin-Bonded CUP WHEELS provide maximum strength for continuous high-speed smoothing jobs. Faster, safer – wheels from 2½" to 8" are speed tested at 50% higher than normal snagging speeds . . . wear longer, seldom need to be dressed. Good reasons why you keep cutting costs down with Atlantic Wheels.

Atlantic Abrasive Corp.

A DIVISION OF ABRASIVE PRODUCTS, INC.

South Braintree 85, Massachusetts



STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS
CONES • PLUGS • MOUNTED WHEELS AND POINTS

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"My sideline's paying off. Tumble-finishing castings."

28. Oscillating Belt Grinder. Bulletin TM-459 illustrates and describes the new Tri-Matic belt grinder, which is notable for the oscillating tracking arrangement for belts, and which is said to speed grinding, prolong belt life, and reduce grinding pattern to a minimum. Other advantages mentioned are quick-change arrangements for both belts and contact wheels, and an adjustment of the air sensing unit which permits use of four widths of belts, from 6" to 12" wide. Tri-Matic Division, Sales Service Mfg. Co., St. Paul, Minnesota.

29. Grinding Wheel Adapters. Catalog lists prices for the complete line of Sopko grinding wheel adapters, as well as describing them. For use with all popular surface tool and cutter grinders, the adapters are precision-made, hardened and ground. Four new models of adapters are featured. Wm. Sopko & Sons Co., Euclid, Ohio.

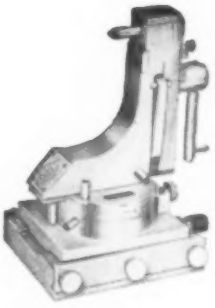
30. Safety Kit. A collection of ten brochures on the general subject of grinding wheel safety, plus a list of color films and a speech on the subject. Included are publications from the Grinding Wheel Institute and Norton Company. Among these are the Primer on Grinding Wheel Safety, the Safety Code, and brochures on the safe operation of various types of grinders. Norton Company, Worcester, Massachusetts.

31. Mercury Arc Lamp. A four-page folder announces the introduction of a new source of light for optical inspection, a mercury arc lamp which is said to give more than five times the intensity of the best filament light source formerly available. It is also claimed to provide an extremely sharp shadow, even at 250 magnifications. It can also be quickly interchanged with the standard light source on any J & L 14-inch or 30-inch comparator. Jones & Lamson Machine Company, Springfield, Vermont.

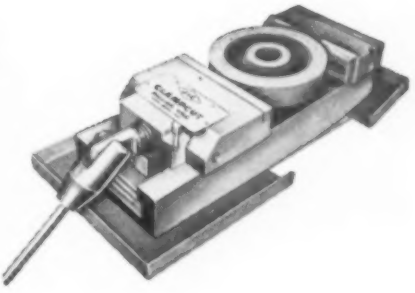
32. Stainless Steel Gage Blocks. New literature describing stainless steel gage blocks, recently announced by The DoAll Company (see page 64) is now available. It gives full information about sets grades, and prices. Several outstanding features of the new blocks are discussed. These include greater hardness, longer wear, superior stability, and better resistance to corrosion, in comparison to regular steel blocks. The DoAll Company, Des Plaines, Illinois.

33. Trigonometric Chart. A handy, pocket-size trigonometric chart for the quick and easy figuring of the natural functions

J&S DOWN-HOLDING DEVICES and WHEEL DRESSERS LEAD THE FIELD

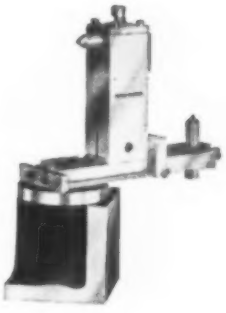


Fluidmotion Wheel Dressers—Dress two angles tangent to a radius, using ONE handle in one continuous motion. Operation is so fast and simple that beginners can use them. For all types cylindrical and surface grinders.



J & S Swivel Vise—The only hardened and ground swivel vise that mounts low, swivels, needs no pedestal. Patented down-holding clamping jaws give many times the holding power of an ordinary vise, yet only half the weight.

J & S All-Purpose Jaw Clamps — For any machine table or face plate. Five models—one adjusting screw has a holding force of 2½ tons on Small model, 12 tons on Jumbo model. Eliminate u-clamps, straps and fingers. No obstruction problems, no interference with measuring tool readings.



J & S Form-Master—Sturdy wheel dresser for shops with less frequent wheel dresser requirements. High quality, 100% dust-proof, it is capable of dressing any radii up to 12" convex, up to 15" concave.

Write for free literature and further information.

J&S TOOL CO. INC. — JAW CLAMPS • PRECISION VISES • DOWN-HOLDING DEVICES — **CLAMPCUT**

J & S TOOL CO., INC.

880 DORSA STREET
LIVINGSTON, NEW JERSEY

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NEW KIRK & BLUM

Dust & Fume Control CATALOG

52 pages showing 60 different installations in major industries

See how Kirk & Blum engineers the best suited dust and fume control system for each particular application.

See how Kirk & Blum provides one source for the complete operating system—design, fabrication, installation—*one* undivided responsibility.

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THE KIRK & BLUM MANUFACTURING CO. 3124 Forrer St., Cincinnati 9, Ohio

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City_____ Zone_____ State_____

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FREE LITERATURE *continued*

of angles, sines, cosines, tangents, cotangents, secants, and cosecants is now being offered. The chart incorporates actual diagrams of the most common angular problems along with simple reference formulae. J. T. Slocomb Co., South Glastonbury, Connecticut.

34. Tape controlled gaging. Describes digital readout and other features of tape controlled gaging. The readout, gage data may be stored, recorded or processed in any desired way. Use of perforated tape eliminates need for preparing templates and other special gage tooling. Diagrams and illustrations of the Data-Limit concept. Pratt & Whitney Co., Inc., West Hartford 1, Connecticut.

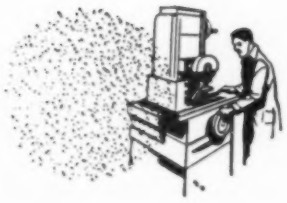
35. Handbook of Dust and Mist Collection. Basic information about the selection of dust and mist collectors, including type and number of machines for grinding, buffing, and polishing that each machine can service. Data and applications of common accessory equipment such as filter shakers. Aget Manufacturing Co., Adrian, Mich.

(See Number 13)

36. Resin Bonded Coated Abrasive Discs. Literature describes a comprehensive line of coated abrasive discs, resin-bonded, with vulcanized fibre backing. Available in a wide variety of grits, both aluminum oxide and silicon carbide, these discs may be used either wet or dry. Bates Products, Inc., 1131 E. 74th Street, Chicago 19, Illinois.

37. Who Gets Hurt? On-the-job injuries presented in a humorous approach through multicolored cartoons and concise text. The pamphlet fingers the man who thinks he is invulnerable as the one who gets hurt. The publication explains the type of worker most likely to get hurt, the effects of injury on workers and their families, where accidents happen, and what each person can do about them. Single copies free. National Safety Council, Chicago, Illinois.

100. Sam Safety Posters. Single copies of the six "Sam Safety" cartoons which have appeared in the last six issues of GRINDING and FINISHING are available on request as long as the supply lasts. Also available in quantities. Use the Reader's Service Card to request prices.



Equipment and Materials

New Metal Polishing Machine

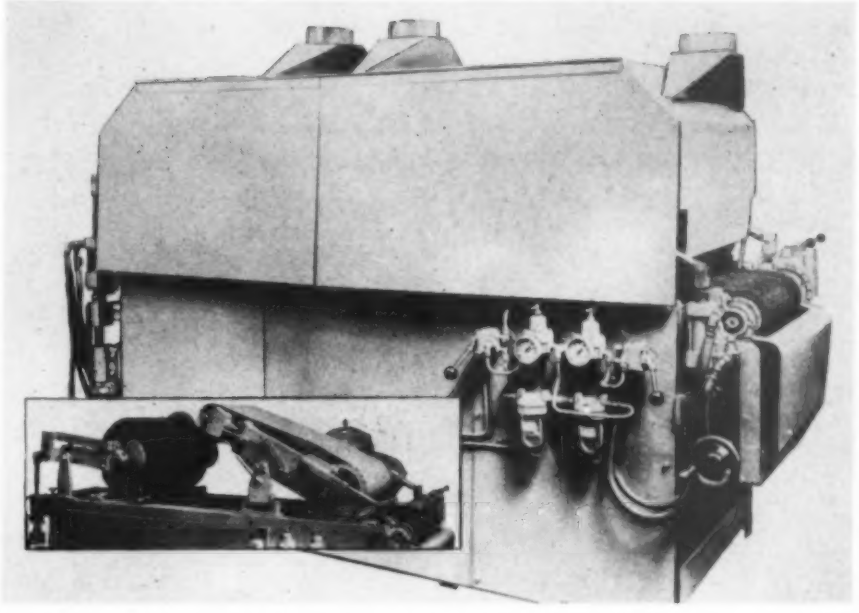
A new dual head polisher incorporating a wide abrasive belt head and a 3M "Scotch-Brite" wheel can be used for polishing metal sheets, flat stampings or extrusions and strip stock.

On this Timesaver "Speedbrite" polisher the material is fed onto a conveyor belt that passes under both heads, resulting in increased production for this type of operation. Model SB is available in 12" and 18" widths.

Hinged panels provide easy access to the heads. Abrasive belts can be changed in two to three minutes. Unit has hydraulic adjustments for pressure, and is fully automatic in operation. A provision for oscillating the "Scotch-Brite" head prevents marking of work.

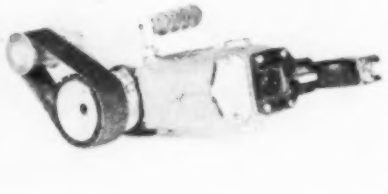
Timesaver Sanders, Minneapolis 22, Minnesota.

Use postpaid card. Circle No. 38



Portable Belt Grinding Attachment

An abrasive belt grinding attachment suitable for attachment to both angle and straight wheel type portable grinders of any make, whether powered by air or electricity, is now available.



The attachment is claimed to be ideal for grinding all contours, and especially beneficial where a straight-line finish is desired. It is equipped with quick-change belt changer.

Three 2" x 20" abrasive belts are supplied with the unit. Where it is to be fitted to an angle grinder, an adapter for the side handle is also supplied.

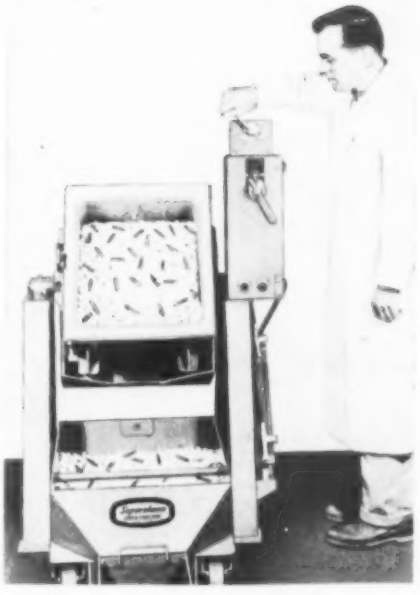
The Nedco Company, Waltham, Mass.

Use postpaid card. Circle No. 39

Low-Cost Vibratory Type Finishing Machine

A new low-cost vibratory type finishing machine, Model VT-72 Vibrasheen, is reported to offer all the advantages of vibration for finishing metal parts at greatly reduced time cycles as compared to conventional barrel finishing equipment. Typical uses include operations such as deburring, descaling, burnishing, and surface refinement.

With a 2½ cu. ft. capacity, the new unit needs only 5½ sq. ft. of floor space. It has a standard vibrating frequency of 3380 cycles per minute. A variable speed drive can be furnished



to give a range of frequencies from 600 to 3380 cycles per minute.

The tub can be pivoted through an arc of 130° for easy loading and unloading. The vibratory mechanism is

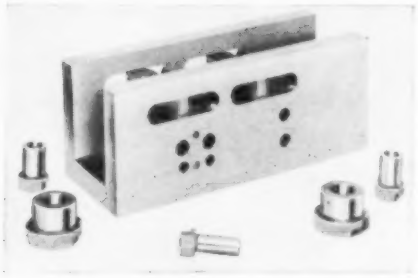
adjustable for an impact range of from 600 to 2500 lbs.

Almco, Queen Products Division, King-Seeley Corporation, Albert Lea, Minnesota.

Use postpaid card. Circle No. 40

Standard Cast-Iron Sections for Jigs and Fixtures

Standard micron cast-iron shapes for the economical building of small jigs and fixtures are now available. Shapes include U's, T's, H's, hollow squares, rectangles and flat plates. They are cast in a practical range of sizes from



3" to 8" and lengths of 25", which are cut to order.

Made of high tensile strength cast iron, the sections have all outside surfaces machined square and parallel within .005" per foot. Micron sections are carried in stock to be cut to length for immediate shipment.

Ex-Cell-O Corporation, Detroit, Mich.

Use postpaid card. Circle No. 41

Double-Acting Depth Gage Simplifies Groove Location

The accurate determination of the location of either internal or external grooves is said to be greatly simplified by means of the new Mueller Depth Gage.

By means of a dial indicator that accurately measures the travel of the footed rod, direct measurements may be obtained for both the location and width of a groove in one simple operation. Both straight and footed rods

of various lengths increase the useful range of the gage; by adding a measuring ball it becomes a pin gage. With straight rods it can be used as an ordinary depth gage.

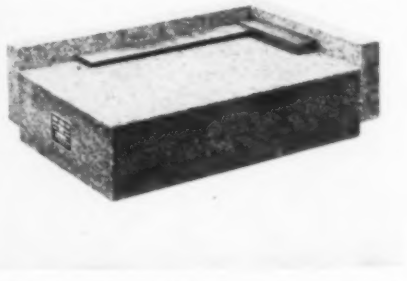
Mueller Gage Company, Pasadena, Calif.

Use postpaid card. Circle No. 42

Inside Square Surface Plates

A new type of precision granite surface plate, designed for rapid three-dimensional checking, is now available.

This special line of surface plates will speed up checking operations by providing accurate angles that allow two or three sides of a precision part to be checked simultaneously.

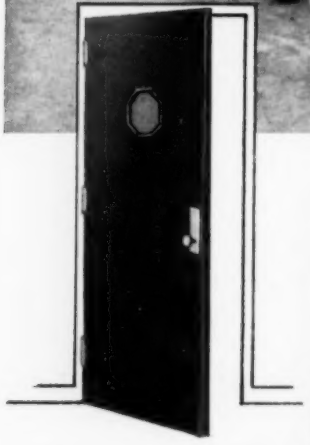


Inside square plates may be produced with one or two vertical sides. All angles formed by the sides and the base are held to an accuracy of 90 degrees ± 3 seconds. These plates are manufactured of true quartz granite to assure long life and stability.

The Herman Stone Company, Dayton, Ohio.

Use postpaid card. Circle No. 43

Here's how TRUSSBILT . . . opened the door to improved quality in metal finishing operations



The TRUSSBILT DIV. of Siems Bros., Inc., St. Paul, Minn. . . . a leading manufacturer of flush steel doors used throughout the world; recently installed a tandem set-up of Timesaver "Speedbelt" Sanders in their steel door finishing line. Using a Model TOP and Model SPL, both face sheets of the doors are given a rough finish on the first pass through the line.

Low spots are then filled and doors are put through the line a second time for finishing. This provides a tremendous production advantage over previous hand operated methods, while eliminating variations in finish quality. The Timesaver line can handle approx. 100 doors an hour. This high speed finishing operation precedes dipping and baking operations, efficiently removing weld blemishes, while lowering high spots and smoothing out filled in valleys.

TRUSSBILT's experience is typical of Timesaver "Speedbelt" installations throughout the country . . . where the needs for better quality, better production and lower units costs is important. You, too, can enjoy the advantages of wide abrasive belt finishing and polishing in your shop at a minimum of cost. Investigate the advantages of Timesaver "Speedbelt" Sanders for your metal finishing and polishing operations, now!

TIMESAVER SANDERS

Dept. R-5

Box 7446 • Robbinsdale Station
Minneapolis 22, Minn.

Write Today . . .

Send for literature and prices . . . or request an analysis of your finishing problem. No obligation.

Use postpaid card. Circle No. 230

New Gear Grinder Deburrs, Chamfers Both Ends of Teeth

A twin-spindle automatic high speed grinder designed for simultaneous deburring and chamfering of both ends of the teeth on spur, helical, or bevel gears has recently been announced.

The grinder drives reinforced wheels at 17,000 rpm with standard air spindles. Spindles rotate in directions to prevent wheels from digging in. Standard machines handle gears from 3" to 13" OD; other models have capacity up to 20" OD.

Number of rotations of gear is determined by the amount of material to be removed. Cycle time varies from 20 to 60 seconds, depending on the number of rotations, the pitch of the gear, and its size. Gear rotation speed is selectively adjustable, and grinding pressure on the work is varied by counterweights.

Michigan Tool Co., Detroit, Mich.

Use postpaid card. Circle No. 44

New Safety Glasses Fit Most Faces

A new line of low-cost, universal-fit safety glasses have a patented bridge design that is said to fit 95% of all faces. This was developed to meet a need for an effective eye-protection program without large inventory and individual fitting by trained personnel.

Willson Products Division, Ray-O-Vac Company, Reading, Pennsylvania.

Use postpaid card. Circle No. 45

but TORIT Dust Collectors protect your workmen and build good morale

Clean working areas make healthier, happier, *more productive* workmen. Torit Dust Collectors trap dust before it irritates workers. Unitized Torit Dust Collectors are completely portable—cost a fraction of central built-in units and are not limited to particular areas. In addition, Torit Collectors save heat by recirculating clean filtered air.

Free descriptive handbook describes all models and applications. Write today to .....

TORIT MFG. CO. Department 508, 1133 Rankin St. Saint Paul 16, Minnesota

Use postpaid card. Circle No. 231

Stainless Steel Gage Blocks for Shop, Inspection Use

Stainless steel gage blocks, said to be the first developed for commercial use, are now being marketed by The DoAll Company. Tests conducted over the past year, following a long period of research and development, are reported to show the new blocks superior in each of the nine categories used for gage block evaluation.

Stainless block surfaces are 68 to 70 Rockwell C, as compared to 65-66 for regular steel blocks.

Only one in five stainless blocks showed any corrosion in the tests, as against four in five for conventional steel blocks.

Requiring less care than regular steel blocks, these stainless steel gage blocks are expected to extend the application of gage blocks in both shop and inspection areas.

The DoAll Company, Des Plaines, Ill.

Use postpaid card. Circle No. 46

New Disc Type Micrometer for Close Quarters

Designed to measure the thickness of closely spaced sections, a new disc type micrometer can be used where clearances are as limited as .015".

The thin, tapered anvil and spindle discs can be inserted into narrow grooves, slots or recesses between projecting ribs, lands or fins, between steps on forming tools or between gear teeth for measuring chordal thickness.

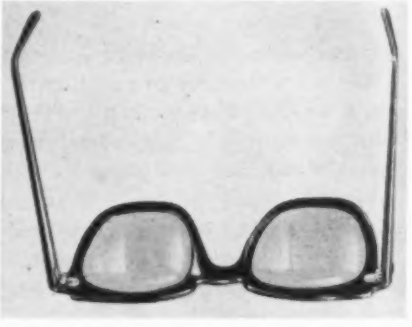
This new Starret micrometer is available in 0 to 1" size with graduations in thousandths of an inch. It can be furnished with or without lock nut or ratchet stop.

The L. S. Starrett Company, Athol, Massachusetts.

Use postpaid card. Circle No. 47

Improved Lens Mounting Marks New Safety Glasses

An improved safety eye-wire, ease in fitting and a bridge design that eliminates the necessity for stocking various eye sizes in a variety of bridge sizes are outstanding features of the new "Varifit" safety spectacle.



Tests have shown that a frontal impact of well over 200 lbs. is required to dislodge the lens from its mounting.

United States Safety Service Co., Kansas City, Missouri.

Use postpaid card. Circle No. 48

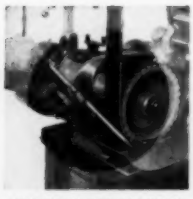
New Coolant Provides High Work Visibility

A new coolant, know as KLEER-60, is said to provide a high degree of work visibility for grinding operations where exceptionally fine tolerances are required.

Prepared as a concentrate, the coolant provides high penetration around the cutting edge of the wheel even at high cutting speeds because of its low surface tension, high extreme pressure characteristics and superior wetting qualities. High in chip settling capacity, the material is said to be non-foaming and bacteria-static.

You'll get increased production plus greater versatility with a

Hammond UNIVERSAL BELT GRINDER


CONTACT WHEEL GRINDING

FLEXIBLE BELT GRINDING

ROD GRINDING HOLDER

TABLE & PLATEN GRINDING

CONTOUR WHEEL GRINDING

INTERNAL GRINDING

This modern Hammond Universal Belt Grinder provides more ways of using abrasive belts on one machine than ever before. It can be used for a wide variety of grinding, polishing, buffing and deburring operations. This time-saving machine will speed up production and decrease labor costs on many operations in your tool room, machine shop, fabricating, assembly and other departments. Can be furnished as a bench or floor model, with or without built-in DusKolector. Many combinations available. Write for catalog.

Model UBC-50 — Other combinations available.

GRIND...POLISH...BUFF...DEBURR ON ONE MACHINE!

Hammond Machinery Builders INC.

1651 DOUGLAS AVE. • KALAMAZOO, MICHIGAN

AMERICA'S MOST COMPLETE LINE OF GRINDING, POLISHING AND BUFFING EQUIPMENT

Use postpaid card. Circle No. 232

KLEER-60 is non-corrosive to copper, brass, aluminum and magnesium, is said to be excellent for centerless grinding.

Shear-Speed Chemical Products, Division of Michigan Tool Company, Detroit, Michigan.

Use postpaid card. Circle No. 49

New 90° Indicator Gage

This time-saving indicator gage is primarily designed to provide toolroom, inspection and production personnel with a quick and simple means for accurate checking of 90° work angles. It can also be used with angular sine plates to check the precision of angles other than 90°. In addition, such items as mounted die details can be checked for relative position by using gage blocks in combination with the indicator gage. This device is said to outmode feelers, shims, and sighting methods.

Omer E. Robbins Company, Detroit, Michigan.

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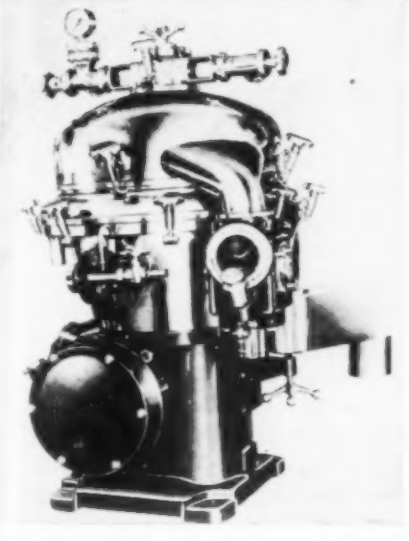
Self-Opening Centrifugal Separators

A complete line of self-opening centrifugal separators for the continuous processing of liquid mixtures having high solids content has recently been announced.



Designated as the Model PX line, it consists of three models: PX 207, with a capacity range of 200-1500 gph; PX 309 of 400-3000 gph capacity; and PX 213 of 1000-6000 gph capacity. Specific capacity depends upon type feed and solids content involved.

PX machines are designed for feed material with a maximum specific gravity of 1.5. Special bowl designs are available for liquids and solids with higher specific gravity.

The De Laval Separator Company, Industrial Division, Poughkeepsie, N.Y.

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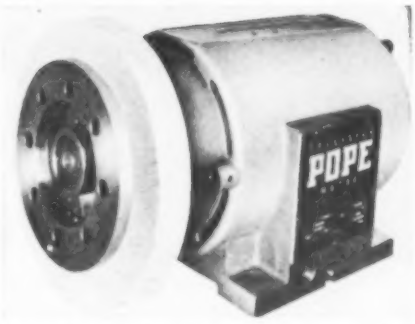
Custom-Built Motors in NEMA Frame Sizes

A new line of precision, custom-built motors in NEMA frame sizes has been put on the market by Pope Machinery Corporation. Designed for applications



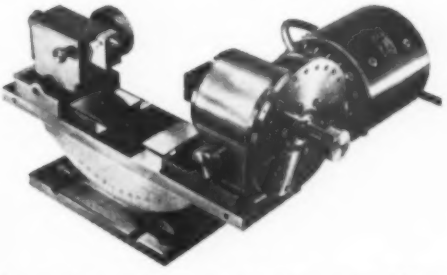
where precision drive is a necessity, these motors are dynamically balanced to .000025" amplitude of vibration and .000050" maximum shaft runout.

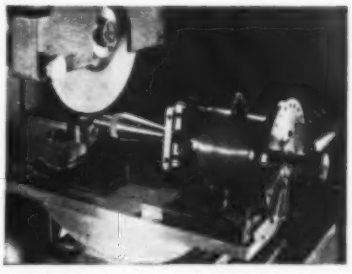
Motors in the line are available in 1 to 20 hp, with speeds from 900 to 3600 rpm, and with straight or tapered noses.

The motor pictured shows a precision grinding application, with a Pope balancing type wheel holder. Provision

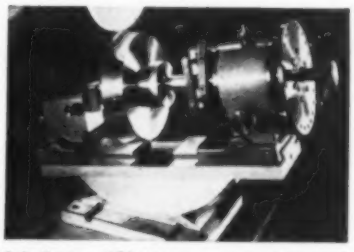
Save on small grinding jobs with Moore Motorized Centers

Toolroom attachment for surface grinders, jig borers, drill presses, millers, etc., handles flat, curved or circular work in one setting.

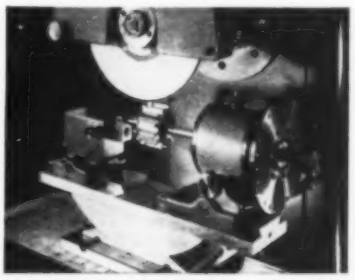




Double tapers and hex shoulder ground with a single setup.



Grinding a 10° taper on a machine part 5" long, 5" in diameter on centers.



12 equally-spaced slots in punch holder ground by using index plate.

You no longer need to tie up large machines on grinding square and round punches . . . doing taper grinding, index grinding and faceplate work. Moore Motorized Centers, a portable, precision-built accessory, can be set on a surface grinder chuck in a jiffy and the job completed quicker than the grinding wheel on a large machine can be changed. You'll save on toolroom labor and materials.

With Motorized Centers, in one setting, you can grind flat, curved or circular work—in any combination of taper or contour—all within .0005". The index plate allows indexing in the same operation, too. Tapers can be reversed or changed by loosening two screws in the rocking bed, and the index plate can be engaged by merely pressing a plunger. The simple tailstock center readily permits the use of specials—male, female or cutaway.

Catalog with 20 Action Photos shows many toolroom jobs you can handle with this versatile tool. Write for a copy today.

SPECIFICATIONS	
Length — overall	12"
Width — including motor	10"
Height — overall	8"
Distance between centers — maximum	6"
Centers will swing	6"
Max. grinding angle (using 10° angle block)	30°
Motor	1/25 H.P., 115 volt, 60 cycle
Work Speeds	110-220-440 R.P.M.

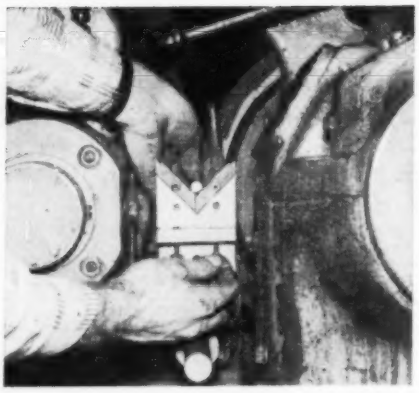
Moore Special Tool Company, Inc.
725 Union Avenue, Bridgeport 7, Conn.

Use postpaid card. Circle No. 233

has been made in the base for mounting a wheel guard.

Pope Machinery Corporation, Haverhill, Massachusetts.

Use postpaid card. Circle No. 52



Adjustable Outboard Supports for Centerless Grinding

Adjustable outboard supports mounted at both the entry and exit ends of a centerless grinder align workpieces to eliminate taper and control size from end to end, allow them to be removed in alignment as well.

Each support has two sliding jaws with thumb screws below for accurate adjustment of the jaws. Lock screws hold the jaws firmly in place.

Brackets for the supports can be fitted to centerless grinding machines of any make, size or model. They permit a rough adjustment for length of the workpieces.

Use of the supports, it is claimed allows one man to operate a centerless.

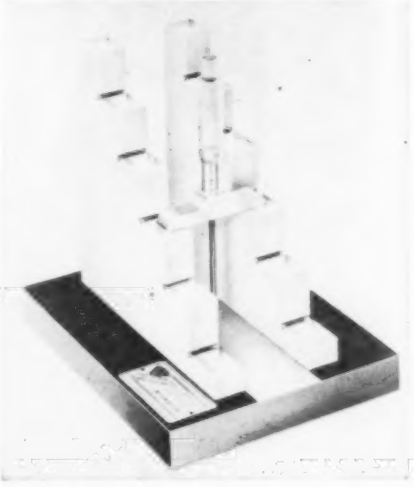
Livingston Tool & Development Company, Belmont, California.

Use postpaid card. Circle No. 53

Check Depth Micrometers

Fourth in a series of micrometer checking devices developed by Size Control Company in 1959 is the Depth-Mikemaster®, created to insure the accuracy of depth mikes. It also assures that rods are properly seated and adjusted, and tends to eliminate scrap from improper measurements.

The device is constructed of chrome plated hardened steel, with an accuracy of .0001" on each step. Its range is from .500" to 5.500" in six steps. Adding gage blocks to steps makes it possible to determine lead-screw accuracy of a micrometer and checks it to different sizes.



Size Control Company, a division of American Gage & Machine Company, Chicago, Illinois.

Use postpaid card. Circle No. 54

Power Chuck Introduces Ball Joint Actuation

Ball joint actuation replaces the conventional "T" slot design on the new "Ball-Lok" power chuck. The new design is said to afford pull-back action against fixed work stops, resulting in greater accuracy and rigidity in chucking parts.

Up to 5 to 1 linkage ratio generates a tremendous gripping power. The entire actuating mechanism is completely

One Sundstrand magnetic chuck holds all sizes of parts machined on this grinder . . .

Small, medium, or large parts, the deep penetrating power of a Sundstrand magnetic chuck holds them securely, simplifies set-up, and eliminates clamping time. Get complete information—ask for Bulletin 312

Here, the Sundstrand chuck holds a load of 102 gears.
Here, the same chuck holds four slide castings.
Here, a large drill press frame is held securely.
SUNDSTRAND
POWER-GRIP

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SUNDSTRAND-AMERICAN BROACH • Ann Arbor, Michigan
Division of SUNDSTRAND CORPORATION
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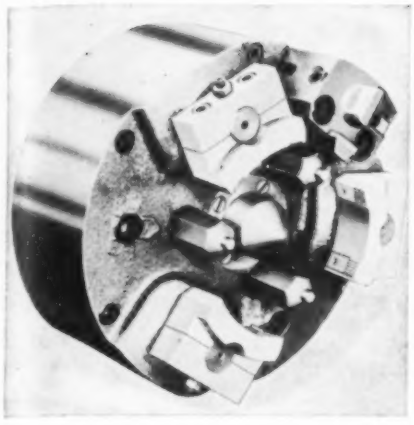


lubricated and sealed, eliminating wear due to chips and foreign matter.

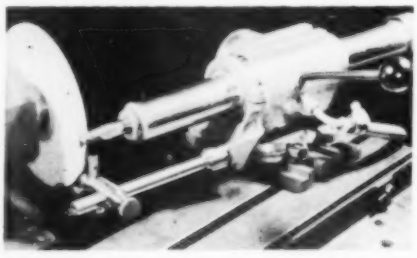
Chucks are available in standard sizes, 10", 12", 15", and 18" for both internal and external applications. Special sizes are available on request.

N. A. Woodworth Company, Detroit, Michigan.

Use postpaid card. Circle No. 55

Air-Floating Spindle Speeds Tool Grinding

A new principle incorporated in the "Air-Flo" sharpening fixture, for sharpening end mills and routers, allows it to operate virtually without spindle friction. The attachment has an ingenious porting system that is engineered to eliminate metal contact of the spindle, which floats on a cushion of air, giving the operator's hand a super-sensitive feel.



This attachment also grinds either straight or tapered end mills both on periphery and ends. Also ground are routers, shell mills, step drill margins and stagger tooth cutters.

Conventional cup wheel or peripheral sharpening methods may be used. Shank sizes up to 1¼" diameter are accommodated on the standard model. Larger shank sizes are available as specials.

Steptool Corporation, Los Angeles, California.

Use postpaid card. Circle No. 56

Standard Geneva Drives

Standard Geneva drives are available with 3 to 24 indexing stations for shaft center distances from 3" to 6" in ¼" increments.

These new drives are claimed to meet the demands of high speed automation in industry. They incorporate precise design and manufacturing techniques to insure performance, accurate indexing, positive locking and smooth, trouble-free operation.

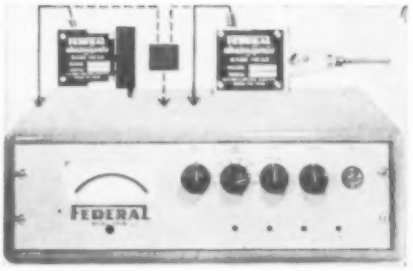
Center distances less than, intermediate, or greater than the standard 3"-6" ranges are available on request.

Genevamatic Engineering Corp., Tampa, Florida.

Use postpaid card. Circle No. 57

Electronic Gaging, Classifying Unit

A versatile and comparatively low-priced electronic gaging and classifying unit, designated Model 230 M-27, has eight ranges from .020" to .0001", four size limits, and five sorting categories.



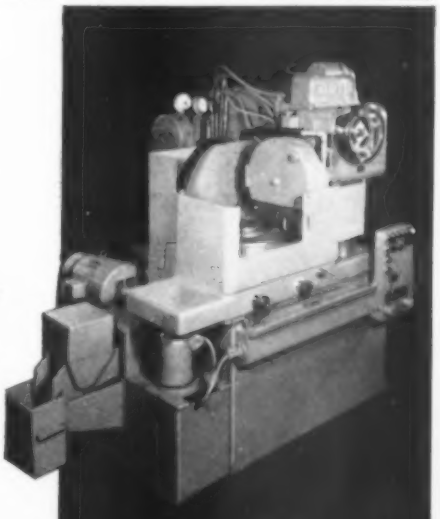
Several gage head combinations can be used with this unit. With the addition of an adapter, two or more gage heads can be switched to the amplifier individually or used in combination.

Electro-probe gage heads with either pantograph-mounted or lever type contacts (both illustrated above) can be furnished with this unit.

Federal Products Corporation, Providence, Rhode Island.

Use postpaid card. Circle No. 58

This Sundstrand-Arter grinder available for toolroom or production grinding...



. . . toolroom type is fed down manually in preset increments, then switched to automatic repeat . . . production type rapid advances to work, then automatically feeds in preset increments. First strokes are rough grinding feed with automatic change to finish. Machine stops and retracts when part is completed.

MODEL E FEATURES

- Rugged column and long ways permit both heavy stock removal and fine finishes.
- Tiltable table for concave or convex grinding.
- Concentric line-grinding pattern.
- Rough and fine wheel feeds permit both operations in same machine.
- Compensation for wheel wear or wheel dressing doesn't disturb feed setup.
- Sundstrand concentric pole magnetic chuck is standard equipment.

Ask for Bulletin 312

SUNDSTRAND-ARTER GRINDERS
SUNDSTRAND MACHINE TOOL • Belvidere, Illinois
Division of SUNDSTRAND CORPORATION

SUNDSTRAND ARTER

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The only complete line of grinding wheel dressers and cutters

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Desmond-Stephan Mfg. Co.
Urbana, Ohio

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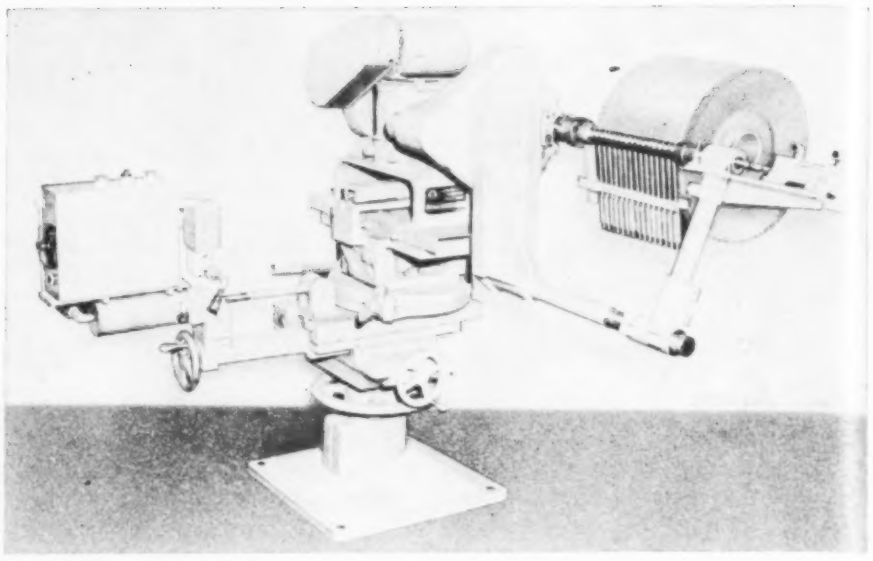

Oscillating-Arm Type Buffing Machine

A new oscillating arm machine that provides a method for automatically buffing or polishing a wide variety of parts having obstructions which prevent complete rotation has recently been put on the market. The machine is said to be ideally suited for buffing parts such as coffee pots with spouts, or ratchet-type wrench heads with handles that prevent complete rotation of the part with the buffing wheel.

Basically the machine consists of an Acme E-10 semi-automatic machine equipped with an air cylinder advance and an oscillating arm fixture. The arm unit can be adjusted to give from zero to 360 degrees of oscillation.

An Acme E-10 machine equipped as indicated above is 4½' high, occupies a floor space approximately 4' x 5'. The arm is powered by a ½ hp motor.

Acme Manufacturing Co., Detroit, Michigan.

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Proven highly profitable and acceptable in applications like:

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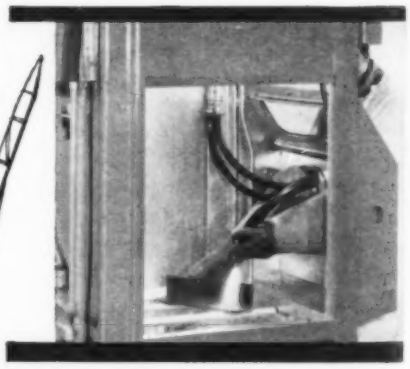
- Cleaning Metals fused to Glass without destroying Glass.



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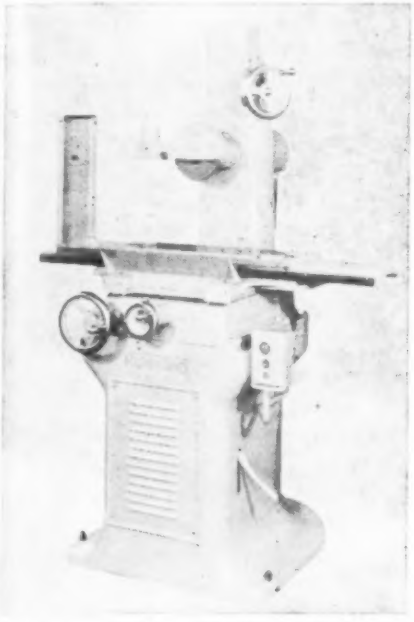
Improved Precision Surface Grinder

The newly redesigned Footburt-Hammond No. 2 surface grinder is a high precision hand-feed toolroom grinder, developed specifically for fine grinding where accuracy and finish are paramount.



An unusual double-dovetail design of the spindle carrier insures high accuracy, it is claimed. The spindle assembly is mounted with the motor in the spindle carrier, as a unit. The push button station has been moved to the front side of the base, where the operator can use it without reaching over the table.

Ex-Cell-O spindle assembly is standard, though others are available. Total vertical spindle adjustment is 10¾"; maximum wheel size, 7" x ½".

Working surface of the table is 6" x 18"; longitudinal table travel is 18"; in-and-out movement is 6½".

The Foote-Burt Company, Cleveland, Ohio.

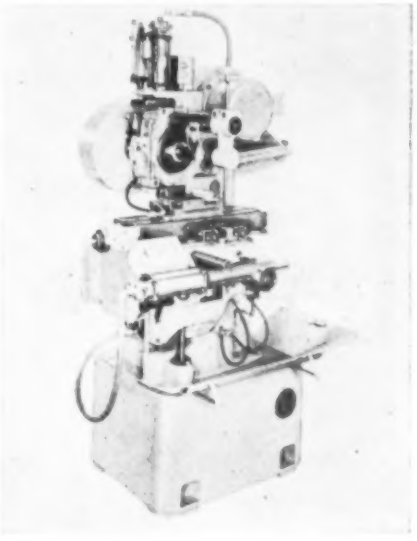
Use postpaid card. Circle No. 60

Automatic Crystal Slicer

To meet the needs of several leading semi-conductor makers, W. H. Nichols Co. has developed a compact, automatic crystal slicing machine combining a variable feed downward plunge cut with a synchronized automatic increment cross feed.

It is claimed that plunge cutting offers the shortest feed stroke, with substantial saving of time due to the slow feeds required for precision wafering. The downward plunge cut permits the crystal boule to be rigidly mounted and supported during the cutting operation.

Provision is made to take slicing blades from 4" diameter to 12" diameter. The cross feed is a pneumatically controlled picker-feed adjustable from



0" to .085" in steps of .001" with repeat accuracy guaranteed—.00025" per increment. Maximum travel is 6".

National Distributors, REM Sales Inc., West Hartford, Connecticut.

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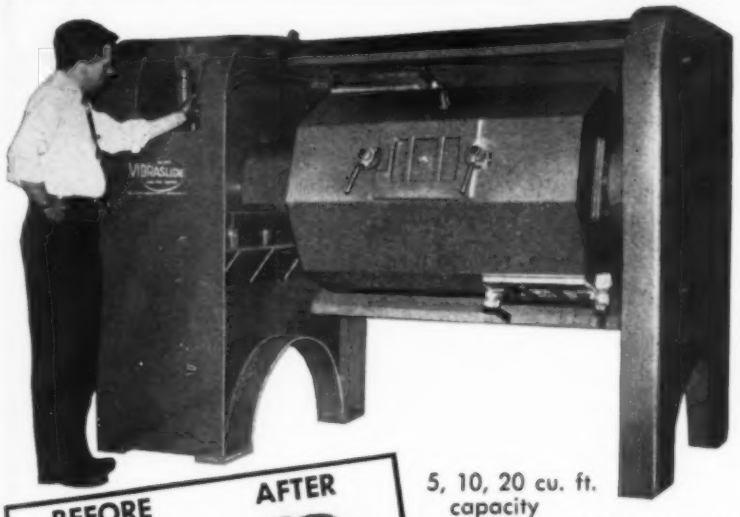

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NEW EQUIPMENT *continued*

Expand Portable Grinder Line

A new 905 series of 8" portable pneumatic grinders has recently been announced by Thomas C. Wilson, Inc.

Heavy duty horizontal grinders, wire brushing machines, and horizontal buffers suitable for up to 8" wheels are included in the series.

The machines offer a choice of four free speeds: 6000, 4500, 4100, and 3100 rpm. Straight, lever, or grip-type handles may be specified.

Other features include lightweight one-piece aluminum housing construction; one-piece hardened and ground spindle; four sealed spindle bearings; and hardened, ground, and honed cylinders.

Thomas C. Wilson, Inc., Long Island City, New York.

Use postpaid card. Circle No. 62

Metal Fiber Wheel for Deburring, Burnishing

A new, patented deburring and burnishing tool is an abrasive wheel composed of a net-like mass of metal fiber, resin-impregnated and heat-cured to form a rigid structure of high strength and great porosity.

On ferrous metals these wheels are recommended for removing fine burrs from machined surfaces, corners, and angles. No distortion is reported, and critical dimensions can be maintained.

For non-ferrous metals, applications include polishing of large and small surfaces and the cutting of lead.

On die castings, speedy deburring with no distortion of shape, angles, radii, or corners is claimed.

The porous structure of the wheels is said to withstand loading, and at the same time to dissipate heat far more effectively than other types of wheels, through the strands of metal fiber.

Antro Abrasives, Inc., New York, N.Y.

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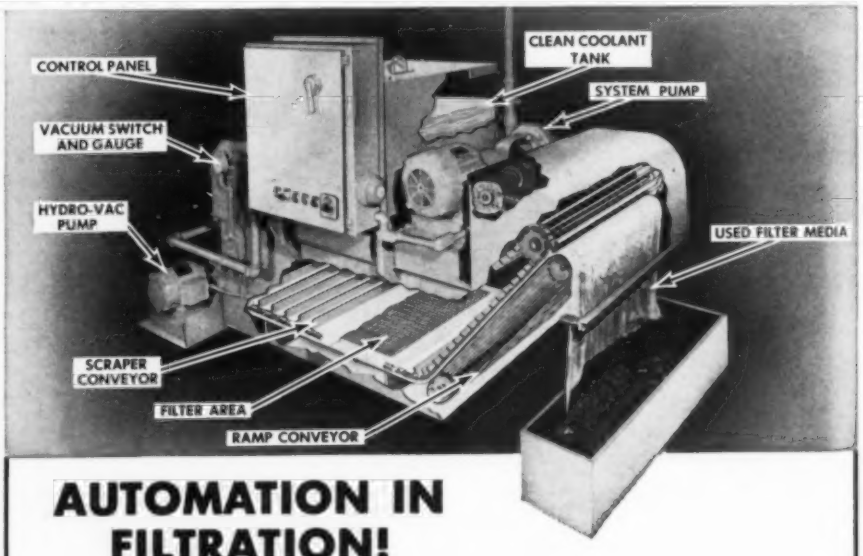

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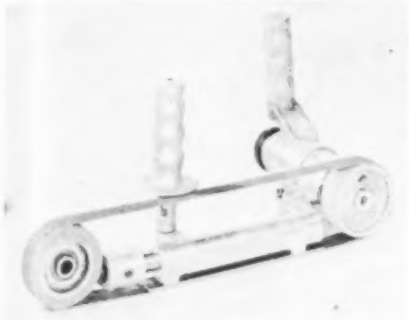
Portable Belt Sander

A new portable abrasive belt unit for operations requiring slack-of-belt, contact wheel, or platen grinding is now in production at Nu-Matic Grinders, Incorporated.

The air-powered unit uses a 1" x 36" abrasive belt. Changing belts is quick; tracking, simple. The air motor is rated at approximately 1 hp at 6000 rpm. Belt speed is 4500 sfpm.



The new unit may be hand-held or bench-mounted. It can be used for heavy stock removal as well as for polishing and blending. Material on which it can be applied include ferrous or non-ferrous metals and plastics. for devices on horizontal spindles.

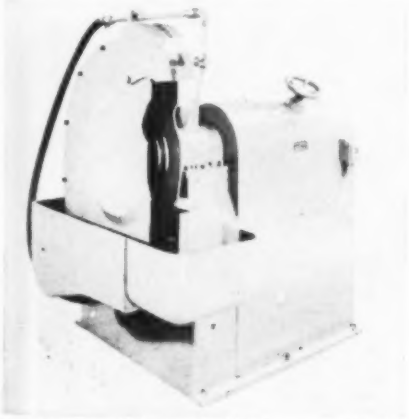
Nu-Matic Grinders, Inc., Cleveland, Ohio.

Use postpaid card. Circle No. 64

Variable Speed Wet Grinder

A new variable speed wet grinder, Model 61 AVSW, is expected to find wide toolroom use for such applications as sharpening form dies and high speed tool bits. Up to 20 hp for 36" x 4" wheels can be developed.

The grinder provides constant peripheral speed. Maximum peripheral



speed for either vitrified or resinoid wheels can be maintained throughout the entire life of the wheel.

An adjustable wheel guard and speed changer are interlocked to prevent overspeeding. The wheel guard is made of boiler plate.

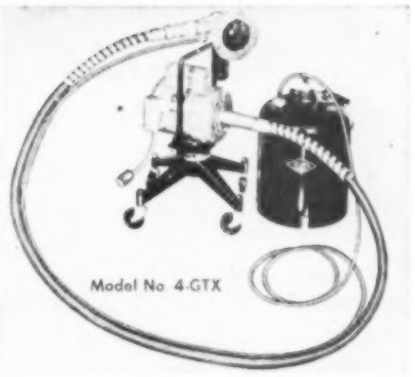
The totally enclosed fan-cooled ball bearing motor is mounted within the base. The heavy chrome-manganese spindle operates in heavy duty ball bearings in dust-proof housings.

United States Electrical Tool Co., Cincinnati, Ohio.

Use postpaid card. Circle No. 65

Flexible Shaft Grinder

A new 1 hp Handy Grinder mounted on a four-leg caster base has the base and handle of welded steel construction, light in weight and reported to be unbreakable. A variety of attachments and accessories equipped with Wyco Quick-Change connectors is available.



Wyzenbeek & Staff, Chicago, Ill.

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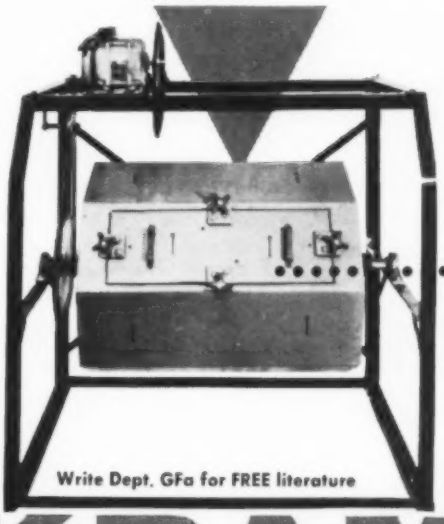

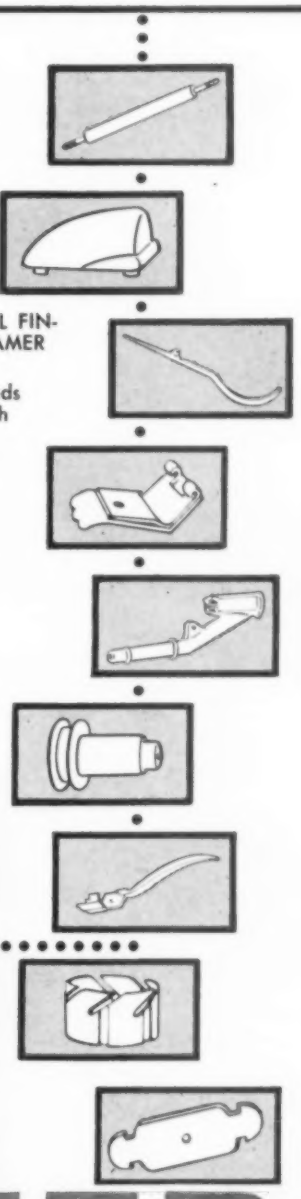

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Ultra-Precision Ball Comparator

A recently-announced ball comparator, specifically designed to measure small lots of balls rapidly and accurately, finds typical uses in the checking of sample lots of production ball runs or the selection of matched sets of balls for diameter and random sphericity.

The fixture can be rapidly adjusted from one size to another, a factor of importance where a large variety of sizes are being checked.

The basic unit is a Cleveland Micro-Ac gage block comparator, with a special fixture which includes several interchangeable slide inserts. Four standard inserts cover the range from 1/32" to ¾" diameter; inserts for larger and smaller diameters are available on special order.

The Cleveland Instrument Company, Cleveland, Ohio.

Use postpaid card. Circle No. 67

"Sit-down" Type Wet Blast Unit

A new wet blast unit which the operator can handle while sitting has been designed primarily for the high production finishing of small parts such as cuff links, sparkplugs, and similar products normally processed by women.

Designated as the Consol-Matic, the unit operates on the aspiration system, which eliminates the need for a pumping mechanism in the blast circuit. Using fine abrasives, up to 5000 mesh, the equipment is reported to produce a fine, satin, chemically pure surface without heavy etching, stock removal, or distortion.

The Consol-Matic is 46" high, 24" wide, and 34" deep. Weighing only 130 pounds, it can be installed on upper floors of buildings where machine weight is often a factor.

Pressure Blast Mfg. Co., Inc., Manchester, Connecticut. • • •

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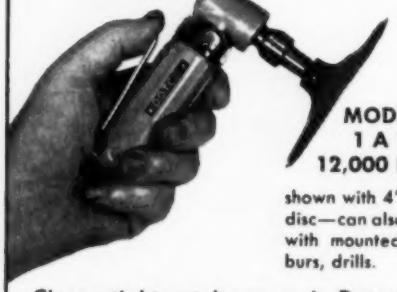
Helping Hands to Boost Production

DOTCO High Speed Super Power AIR TOOLS



MODEL 1 A E 12,000 RPM

shown with 4" sanding disc—can also be used with mounted wheels, burs, drills.

MODEL 1 G L 30,000 RPM

shown with carbide bur—can also be used with mounted wheels and sanding disc.

Erickson Collet Chucks are standard on all these models.

MODEL 2 EL 5 24,000 RPM

shown with mounted wheel—can also be used with burs and sanding discs.

A-771A

Closer, tighter tolerances in Dotco's 4-vane rotary air motor delivers more working power and speed, runs cool and vibration-free at higher speeds with extreme accuracy—holds maximum run-out to .0005 on all collet type grinders.

Use of Erickson collets as standard maintains minimum run-out under load and permits quick adjustment to different shank sizes. Dotco's patented contour design with machined serrations make it easy to grip, even with oily hands—less operator fatigue. Available in straight or right-angle, for manual or machine operation, Dotco Tools have handy lever or button throttle control.

For more information on our 21 models, write for Bulletins 101 and 102.

DOEDEN TOOL CORP. • Sherwood (near Toledo) Ohio

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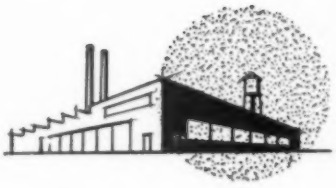

News from the Industry

Bendix Sponsors Numerical Control Training

Since the development of numerical control of machine tools has outstripped the supply of trained maintenance men and programmers, the Industrial Controls Section, Bendix Aviation Corporation, Detroit, Mich., has sponsored training programs in the area over the past three years.

Results indicate that companies whose personnel have completed the programs accomplish better management of their equipment, with less downtime. The program for maintenance runs for three weeks; for programmes, one week.

Group being instructed in operation and maintenance of numerical control system at the Bendix training center in Detroit.

Bay State Sales Appointments

Fred C. Stockinger has been appointed sales manager of Bay State Abrasive Products Company, Westboro, Massachusetts, according to an announcement by **Elden L. Auker,** vice president, marketing. Stockinger has been assistant sales manager since 1958.

In Chicago, **Robert S. Slawson** has has been added to the sales organization. He was formerly with Screw Machine Supply and Tallmar Robbins in Chicago.

F. C. Stockinger

R. S. Slawson

Wheelabrator Acquires Lord Chemical, York, Pennsylvania

Wheelabrator Corporation, Mishawaka, Indiana, manufacturer of blast cleaning equipment, steel abrasives, and dust and fume control equipment, has acquired approximately 80% of the controlling stock of Lord Chemical Corporation, York, Pennsylvania, according to a recent announcement.

Lord Chemical will continue to operate in York as a majority-owned subsidiary of Wheelabrator, manufacturing a line of vibratory and barrel finishing equipment and related materials.

GM Division Expands

A three-million dollar addition to General Motors' Saginaw Steering Gear Division facilities in Saginaw, Michigan, is now under construction. The new building, a 236,000 square foot, one story structure, is slated for completion by April, 1960.

This represents the fifth major expansion in the last eight years for the GM Division.

Engelhard Division To Handle Industrial Diamonds

Engelhard Industries, Inc., leading supplier and fabricator of platinum and other precious metals, has announced the establishment of an Industrial Diamond Division to import, stock, process and sell industrial diamonds in the United States, and to provide technical service, application engineering and basic research to industrial users of diamond.

The announcement was made by **Charles W. Engelhard,** chairman of the company.

He also has announced the launching of an intensive research program to study the more efficient use of industrial diamonds in present applications, and to develop new applications in

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CLOVER Grinding and Lapping **COMPOUNDS**

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which diamonds are more effective and more economical than alternative materials.

Implementing the organization, there has been formed a full-scale regional sales force with offices in seven major metalworking areas.

Personnel and their districts are as follows:

For the entire New England area, **A. Wilfred Nelson,** located in Attleboro, Massachusetts.

Thomas K. Murphy will cover New York state and northern New Jersey, the New York territory.

Horace Ashenfelter III, with headquarters in Philadelphia, represents the division in southern New Jersey, Pennsylvania, Maryland, and Delaware.

Working out of Cleveland, **Erwin C. Winkelmann** is the representative for Ohio, West Virginia, and Kentucky.

Leonard J. Rakocy covers Michigan and some adjacent areas, from Detroit.

Robert T. Brockway is in charge of the Chicago area, primarily Illinois.

Responsible for the West Coast and Texas is **George H. Sinden,** with headquarters in Los Angeles.

The technical service representative, located in Newark, is **John H. Olson.**

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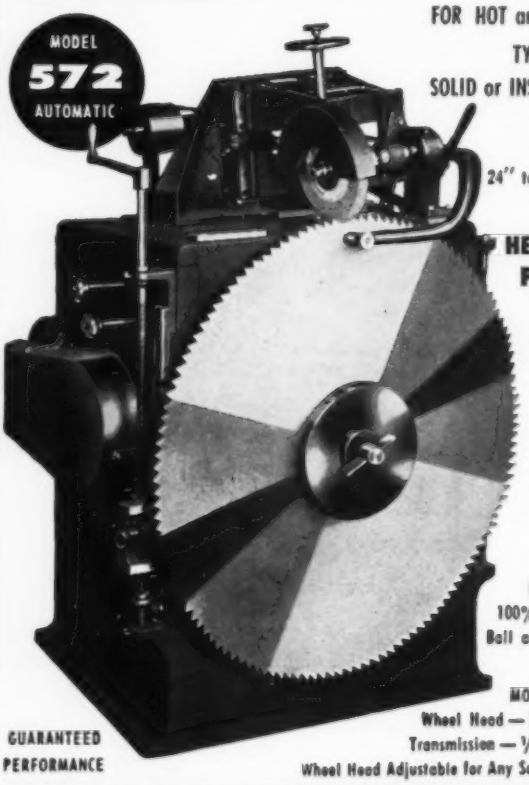

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Nu-Matic Moves Plant, Offices

Nu-Matic Grinders Inc. of Cleveland, Ohio announces it has moved its headquarters and manufacturing operation from its former address—8224 Carnegie Avenue—to 875 East 140th Street, Cleveland 10, Ohio.

Nu-Matic manufactures inflated and expanding abrasive finishing wheels and has just gone into the manufacture of portable belt sanders, inflatable drum sanders and floor mounted sanding machinery.

Floor space at the new location is three times the former space.

Rampe Expands Plant Space

A 100% plant expansion to keep pace with the growth of its line of precision tumbling machines has been started by Rampe Manufacturing Company on its present factory site at 14915 Woodworth Avenue, Cleveland 10, Ohio. The enlarged facilities, doubling present factory space, will provide room for a three-fold production increase in the near future.

The company, long a producer of barrel-finishing equipment, including related motor drive components, recently introduced several new multi-ton machines and has added wider national sales distribution.

The Answer... TO INDUSTRY'S DEMAND FOR QUALITY, EFFICIENCY AND LOW COST ECONOMY

UNITED STATES ELECTRICAL GRINDERS-BUFFERS

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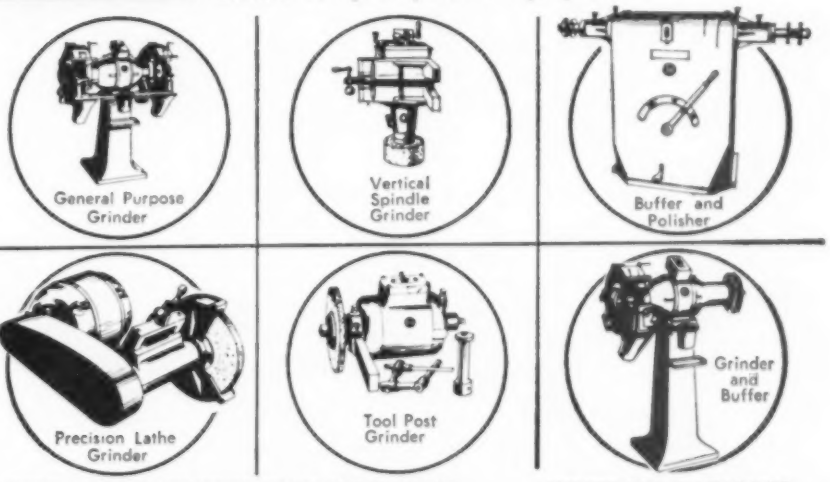

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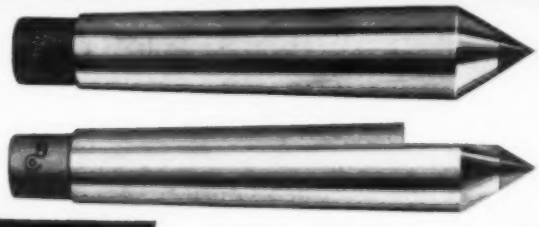

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Hardened to more than Rockwell "C" 60, the mirror finished alloy steel shank resists nicking which causes the center to fit improperly in the grinder resulting in scrap.

Highest quality, extra long carbide insert permits innumerable regrindings. Precision point is lapped to the smoothest possible finish.

Tested for accuracy by the most modern methods, these centers will turn out precision work. Extension on shank prevents damage when center is removed from the grinder.

Morse Taper, Brown and Sharpe Taper and Jarno Taper centers and half centers are available from stock in most popular sizes. Write for literature and prices.

BALAS COLLET MANUFACTURING CO.
CLEVELAND 14, OHIO

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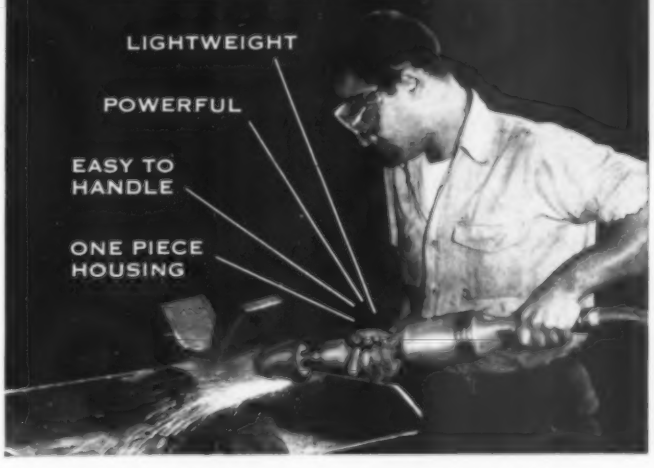
WILSON Pneumatic Horizontal Grinders



Faster grinding...less operator fatigue

Wilson's new Horizontal Grinders speed grinding, buffing, wire wheel work and many other metal removing and finishing operations. Available in various sizes and models, with speeds ranging from 3100 to 12,000 r.p.m. Write for Catalog PT-58.

TW903

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21-11 44th Avenue, Long Island City 1, New York
BETTER TOOLS FOR BETTER WORK

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Claydon Elected Vice President

John F. Claydon, general manager of the Coated Abrasives Division, The Carborundum Company, Niagara Falls, N.Y., was elected a vice president of the company, according to an announcement by **General Clinton F. Robinson,** company president. Mr. Claydon has been with the company since 1935.

J. F. Claydon

Van Norman Promotes Executives

George P. Burns has been elected vice president and sales manager—machine tools, and **William Hyland** has been made western sales manager for Van Norman Machine Co., a division of Van Norman Industries, Inc., according to recent announcements.

G. P. Burns

Norton Names Engineers

Robert V. George and **Edwin R. Larson** have been appointed field engineers for Norton Company, Worcester, Mass., and **Roderick L. Smith** has been named a district sales engineer.

Wm. Hyland

Obituaries

George H. Halpin, 69, vice chairman of the executive committee of Minnesota Mining and Manufacturing Company, St. Paul, Minnesota.

John C. Pangborn, 75, co-founder of Pangborn Corporation, Hagerstorn, Maryland, and recently vice chairman of the Board of Directors and of the Pangborn Foundation.

G. H. Halpin

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1. One to Four Microinch Surface Finish.
2. Hydrodynamically Controlled Motion.
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6. Oil Sealed bearings.
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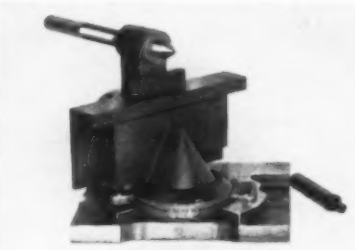

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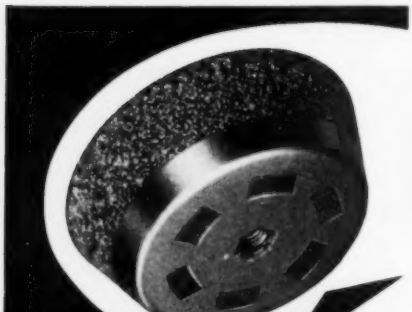

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Slocomb Adds Factory Reps, Distributor

Niles J. Brook, vice president of the J. T. Slocomb Company, South Glastonbury, Conn., recently announced the selection of three factory representatives and a selected distributor for the Slocomb line of micrometers and industrial measuring devices.

Aaron Kostman, 4244 Saline St., Pittsburgh, will cover western Pennsylvania and West Virginia.

Edward C. Lindeman, 3110 North Fitzhugh Avenue, Dallas, Texas, for Texas and Oklahoma.

Revere Engineering Company, 1813 78th Avenue, Elmwood Park, Ill., covering northern Illinois and Wis.

The new distributor is **James H. Cross Company**, Erie, Pennsylvania.

Smico Sales to Represent Torit

Smico Sales Company, Minneapolis-based industrial sales firm, has been appointed sales representative for Torit Manufacturing Company, St. Paul, manufacturer of industrial dust collecting equipment, Frank Chase, Torit vice president in charge of sales, has announced.

Wheelabrator Displays Blast Cleaning at '60 Corrosion Show

Decreasing maintenance problems through the application of airless blast cleaning for preparing metal surfaces for protective coatings will be the theme of the Wheelabrator Corporation exhibit, Booth No. 116, at the 1960 Corrosion Show to be held March 15-17 in the Memorial Auditorium, Dallas, Texas.

Airetool Appoints New York State Representative

Charles W. Patton, East Aurora, New York, has been appointed as a direct factory representative in New York State for the Airetool Manufacturing Company, Springfield, Ohio, according to **R. B. Gordon**, general manager.

In his new position, Patton will provide service and sales of Airetool products throughout the entire State of New York, East to the Hudson River. He will work with **L. B. Miller**, Airetool sales engineer, who has serviced this area for the past 10 years from the company's headquarters office and plant at Springfield, Ohio.

Brown & Sharpe Reorganizes Sales by Divisions

Two recent appointments substantially complete the decentralization of Brown & Sharpe's selling organization. **Harold B. Schott** has been named assistant to the president—sales, and **Joseph E. Kochhan** succeeds him as general sales manager, Industrial Products Division.

General sales managers previously appointed are **Thomas F. MacLaren**, machine tools; **John F. Hines**, cutting tools; and **Borje Rosaen**, hydraulics.

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result in automatization of surface working with the application of the abrasive mop on suitable machines.

Effective and economical for grinding and polishing in all industrial branches—metal, steel, automotive, building, stone, plastic art industry, etc.

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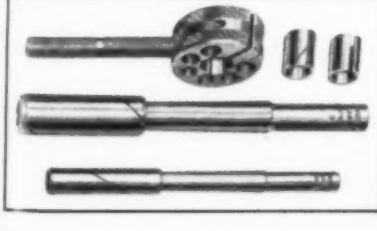

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INTERNAL WITH ARBORS — EXPANDABLE

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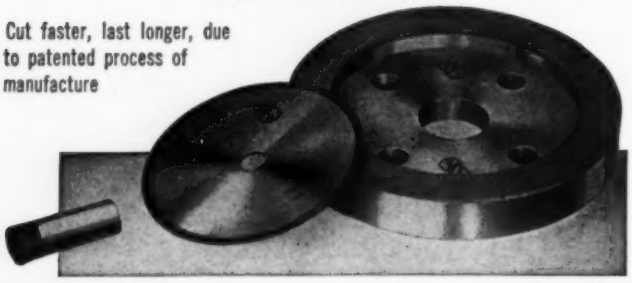

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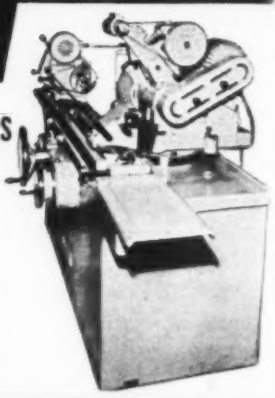

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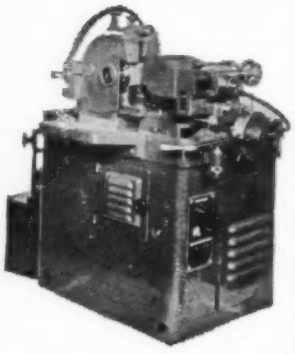

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Close tolerance production units capable of .0001" tolerances in production. Equipped for bar feed, thru feed, and infeed work with automatic ejectors and automatic cycling on infeed where desired.

MODEL 0 Work diameters .012"-5⁄16" $2450.00

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Abrasive Belt attachment for Airetool horizontal grinders. Ideal for fine finishing dies, molds, seam welds, any contour surface.

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GRINDING and FINISHING

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Coming Next Month

No More Guesswork in Form Dressing
The development of light-weight and accurate wheel-forming attachments has taken form dressing of wheels out of the "cut-and-try" stage and has made it a precision operation.

"2-For-1" Set-Up Speeds Sheet Polishing
Integration of two parallel roughing lines with one finishing line allows ample time for stock removal without slowdown in fully automated belt polishing of sheets for bumper stampings.

Why Honing? Part II
Comprehensive discussion of machines and abrasives for honing.

Standard Time Data for Grinding—Part IV
Application of standards techniques to oscillating-type cylindrical grinding.

Grinding for Maximum Life, Minimum Maintenance
Buyers of refrigerators demand appliances that will last forever, never require service. A case study of Whirlpool's answer to this challenge.

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When purchasing a REX SUPERVAN HIGH SPEED STEEL SPINDLE for your Crystal Lake Grinder an additional $50.00 to the purchase price will give you a TWO YEAR SPINDLE GUARANTEE.

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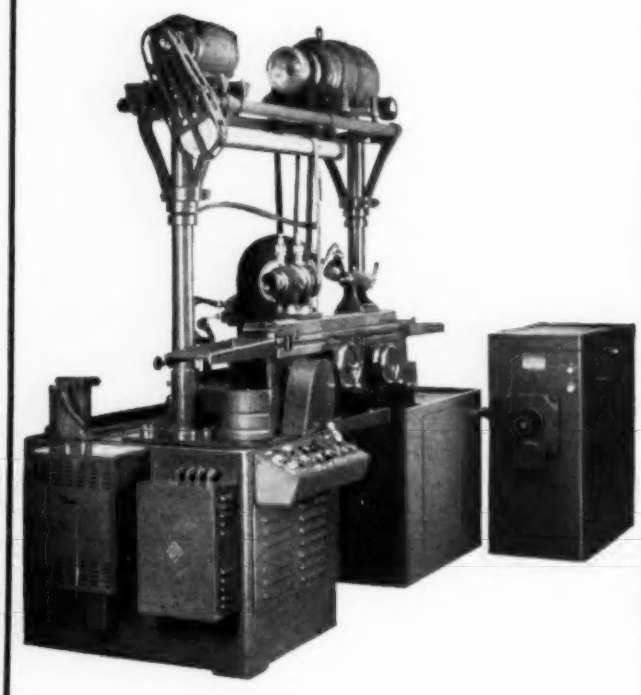
For example, fuel injectors, after having been rough ground, can be ground to .000010" roundness with a sixty grit wheel and one pass of the wheel.



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CRYSTAL LAKE MACHINE WORKS, INC.

Since 1910

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A Final Thought

The Old Is Not Yet Old

An old German reply to the query, "What's new?", is merely, "Nothing is new; the old is not yet old." In this, as in all folk-sayings composed of more facetiousness than prophetic wisdom, there nonetheless lodges a kernel of truth. This is especially true in our field of grinding, where the old is not yet old; where the old has never really been understood, and where the benefits of the new result only from an appreciation of the old.

To many people grinding is no more than a method of obtaining a final, close tolerance, or imparting to the work a finer finish than is obtainable with conventional metal cutting tools. While these operations are old, and are generally understood, the science of grinding—the fundamental universality of it—sometimes is not appreciated.

On many new jobs the conventional cutting tool manufacturer is consulted. Is it wise to select a metal removing tool with 12 cutting edges over a grinding wheel with 1,000,000 cutting edges? The grinding wheel can hog off one-quarter of an inch of metal. Why not consult the grinding wheel manufacturer as well? Why turn automatically to the conventional metal cutting tools, especially if there is something "new" about them, when the grinding wheel can perform the work more efficiently? Too many people do not really understand the old science of grinding, do not appreciate that they can use a grinding wheel successfully on many surfacing and turning jobs. They think too much in terms of finishes and tolerances to be aware that grinding is one of the most efficient hogging operations available today; it is their thinking which must change.

Frequently grinding is by-passed in favor of another, slower, method because "I don't really need such a fine finish as grinding can give me." That's like the man who owns an automobile and a mule but who rides the mule to work because, "All I want to do is get there, I don't have to ride in comfort." And if we think this is silly we need but to visit America's plants to know how many excellent engineers and production people are riding around on mules.

However, to return to our question of what's new. Industry's requirement for precision and even more precision is a hard actuality, no debate rages over the methods to accomplish this. Yet, it is this very emphasis on the new demands for precision that occasions industry to overlook the old, the vastness of the grinding world, the very enormity of the jobs that can be accommodated with a grinding wheel. Industry is so concerned with solving the new problems of precision that it ignores the old, old challenge of fast metal removal. The old principles are used to resolve the new demands, but the old principles are not applied with wisdom to solve the day-in day-out questions.

While the new must claim our attention, let us not forget that the old is not yet old.

Wm. J. Schleicher

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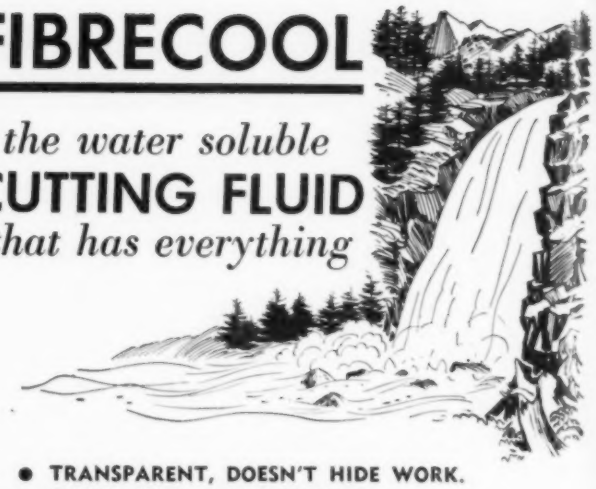

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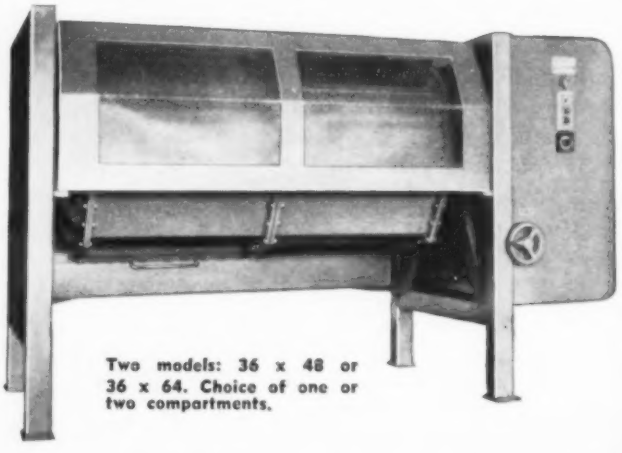

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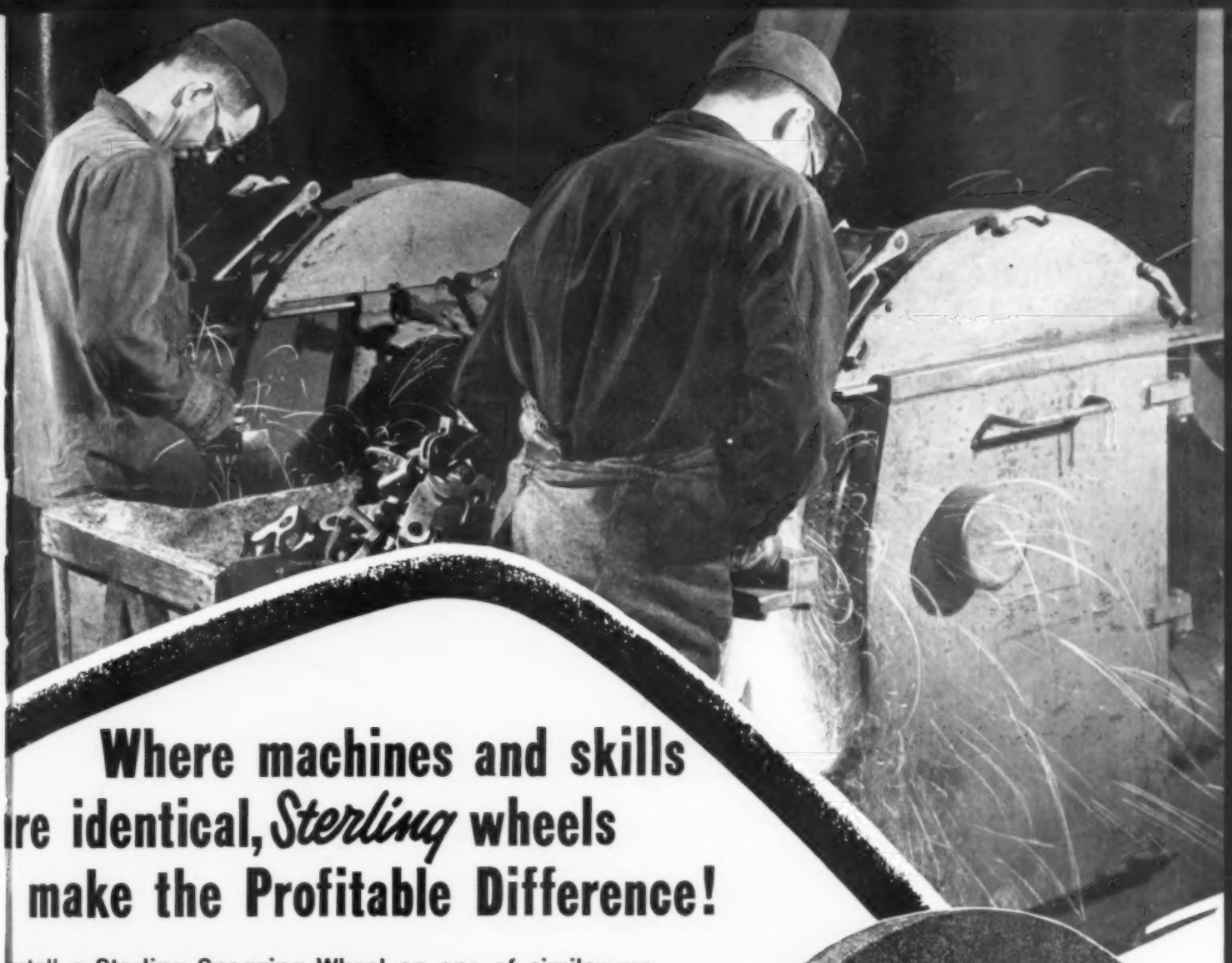

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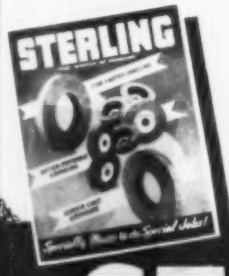

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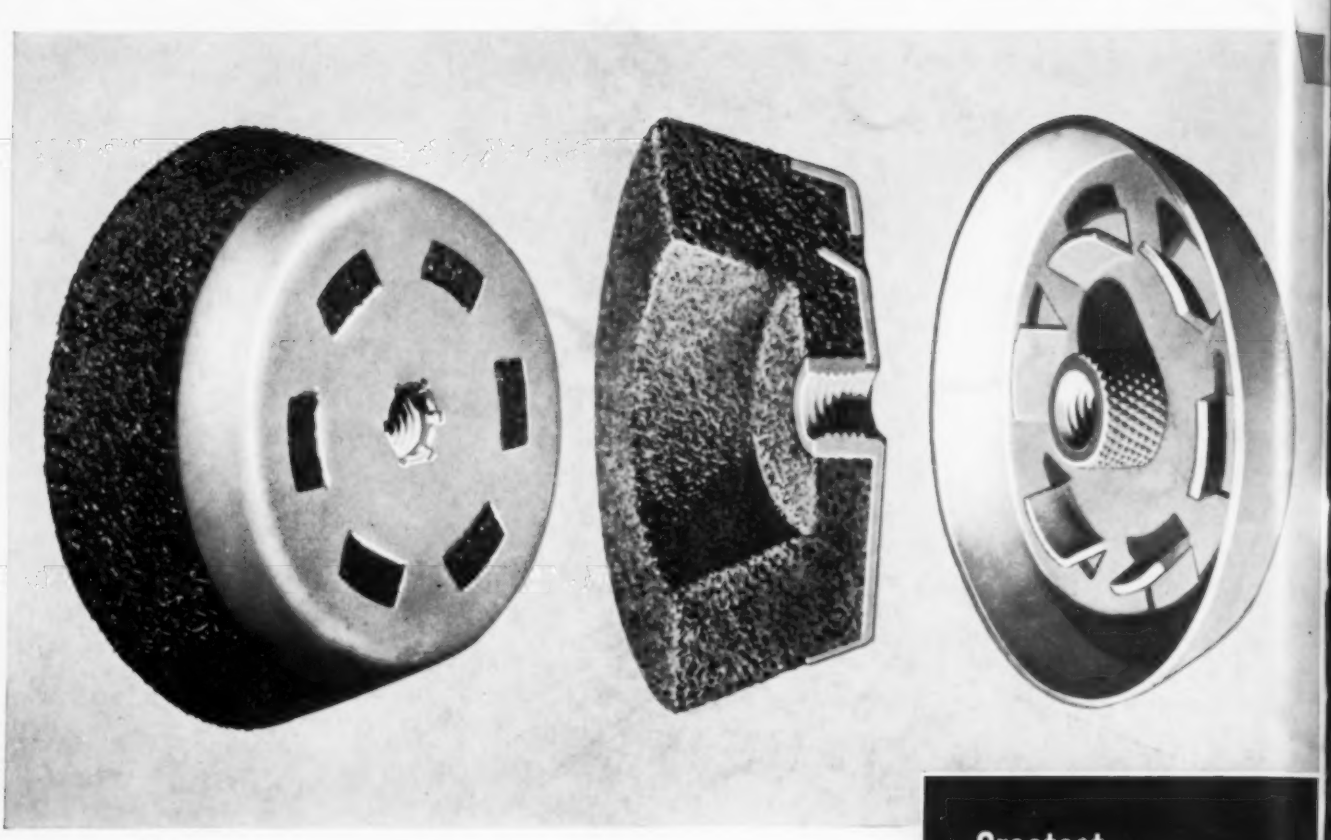

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